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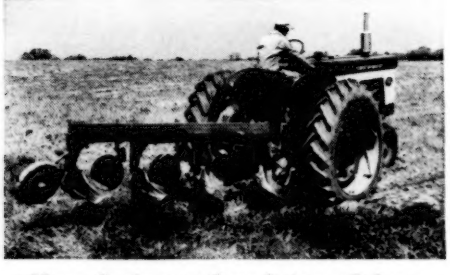

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Journal of SOIL AND WATER CONSERVATION

VOLUME 13
NUMBER 6

TO ADVANCE THE SCIENCE AND ART OF GOOD LAND USE

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COVER: The Work Unit Conservationist is a key man in getting soil and water conservation practices on the land. Orville W. Love, WUC, works with farm-owner Wesley Breichiesen near Gardner, Kansas. They present a scene that is repeated thousands of times yearly, wherever technicians and land-owners "advance the science and art of good land use."

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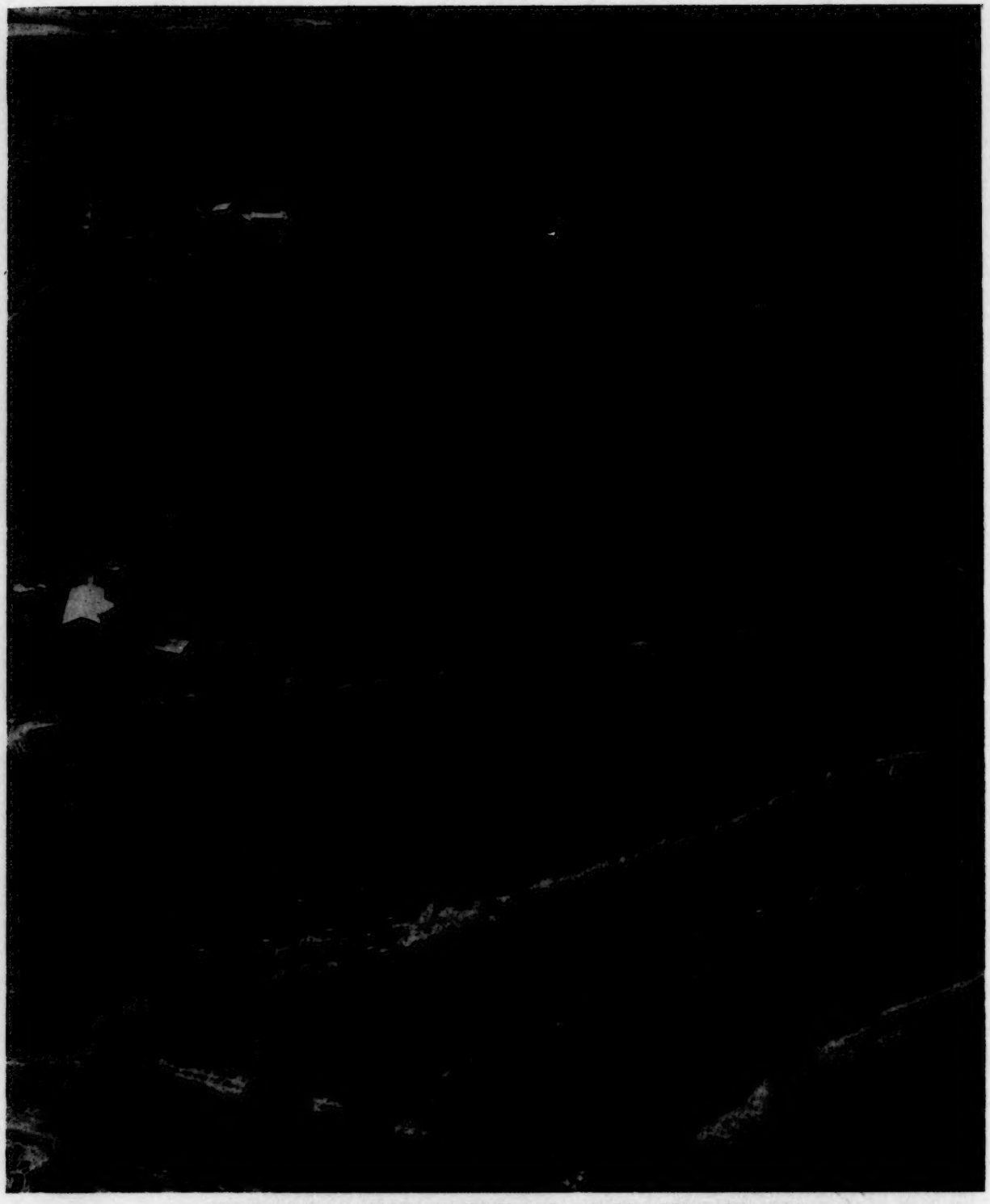


A CONSERVATION FARM IN AN INTENSIVE CONSERVATION AREA (ICA) IN SOUTHERN RHODESIA

Soil Conservation Districts in Other Countries

PHOEBE HARRISON

A STUDY OF SOIL AND WATER conservation programs and accomplishments around the planet brings to light some interesting developments over the last two decades. One is that the soil conservation district, as a field and a design for action, is proving the surest method for getting results, no matter on which of the world's continents or islands it has its boundaries.

These countries have organizations similar to our soil conservation district. That is, they have local organizations formed under state or national laws, for the sole purpose of applying soil and water conservation through community action.

AUSTRALIA—In the **State of New South Wales,** there are 11 soil conservation districts and 43 subdistricts. Governing bodies are Boards of Supervisors elected by local farmers and ranchers. Technicians of the Soil Conservation Service of the state's Department of Conservation provide technical assistance to individual farms and also to watershed and other groups. An important feature of the program is the "Plant Hire System"—a division of the Soil Conservation Service equipped with close to a million dollars worth of both heavy and light machines to do all soil conservation jobs. The "Plant Hire" is available to farmers at reasonable cost and is extremely popular. The Soil Conservation Service reported in 1958 that complete conservation had been applied on 10,700,000 acres of the state's land.

There are 12 soil conservation districts in the **State of Victoria,** with District Advisory Committees as governing bodies. Operations will begin in thirteen other districts that are organized as soon as qualified farm planning technicians are available. All districts are serviced by the Soil Conservation Authority's technicians, a special agency of the state's Department of Agriculture. Seven Conservation Catchment Areas (watersheds) ranging from 400 acres to 60 square miles also have been organized and are in operation.

The entire **State of South Australia** is organized into eight soil conservation districts, each formed by petition of 60 per cent or more of the farmers. The state Soil Conservation Act authorizes such petitions. Latest reports show some outstanding accomplishments in soil conservation work in the great wheat belt, in semi-arid grazing regions, and on land irrigated from the Murray River and the large lakes.

Figure 1. Pasture furrows aid in reclaiming sheet-eroded undulating grazing land in the Hunter Valley of New South Wales, Australia. Runoff is slowed down and the cover and grazing capacity of natural pastures is greatly improved by this moisture-saving practice.

In **West Australia** and **Queensland** the district program is just getting underway. The last report states that two very large districts have been formed in Queensland, and six smaller ones in West Australia. A main objective is to survey and plan new lands for soil and water conservation and see that the plans are adopted as the land is settled and opened for cultivation and grazing.

NEW ZEALAND—Thirteen watershed-size conservation districts (called Catchment Conservation Districts) occupy about two-thirds of the country. In addition, one large soil conservation district, including several watersheds, covers more than 3,000,000 acres. The large districts are sub-divided into many community districts, all governed by local Boards of Directors. The districts

Mrs. Harrison is with the Division of Information, Soil Conservation Service, Washington, D. C. As a part of its regular information program, the Division handles foreign requests for information on soil and water conservation, makes studies of programs and developments in other countries, and maintains records pertaining to the world conservation movement. Information acquired is available to the Department of Agriculture, other agencies, and to the public.

are well supported by the public and the action program is progressing steadily. An outstanding accomplishment is the development of the famous "airbourne" conservation program for the hill and mountain lands by which seed, fertilizers, fencing materials and even conservation plans are dropped from airplanes to hill farmers needing them to avoid delays in getting conservation on the land. The grazing land improvement in the high country is considered the best in the world.

UNION OF SOUTH AFRICA—There were 629 Soil Conservation Districts, including 90 per cent of all land outside native reserves, at the beginning of 1958. Conservation plans had been completed for 502 districts, and approximately 11,000 individual conservation farming plans had been applied. Educational work with natives in the reserves was slow but is now showing encouraging results. More advanced natives are asking that the program be extended to the 64,000,000 acres of their land.

Figure 2. Graded banks and grassed waterways incorporated with shelterbelt plantations improve use of water on this rolling country of North Canterbury, South Island in New Zealand.

RHODESIA-NYASSALAND—Southern Rhodesia had 91 Intensive Conservation Areas as of September, 1957, the last report received, and 20 such areas had been organized in **Northern Rhodesia.** They are governed by local Committees who promote the operations, educational and information programs. The Intensive Conservation Areas follow the pattern of U.S.A. Soil Conservation Districts except that, once they are formed, it is compulsory that every land holder adopt soil and water conservation and apply it as quickly as possible. The areas are serviced by the federal Department of Conservation and Extension, whose technicians help farmers prepare from 800 to 1,000 farm plans a year. Subsidies are provided to help farmers in meeting costs. All land farmed by the European (white) farmers has been put under conservation plans, and in 1956 the responsibility for controlling erosion on land in native reserves was transferred into the hands of native farmers themselves. This was done by implementing the Native Land Husbandry Act which permits division of reserve lands into individual holdings, loans and grants-in-aid, and formation of Intensive Conservation Areas (soil conservation districts) by native farmers.

Since Federation of the three colonies in 1956, formation of Intensive Conservation Areas is being extended to **Nyassaland.**

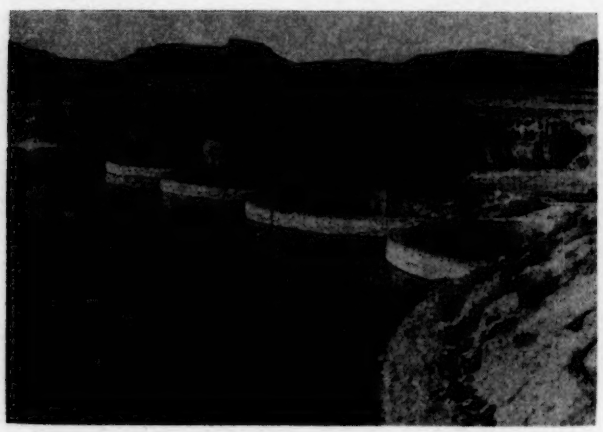


Figure 3. A soil reclaiming project in a semi-arid watershed project at Lowlands, Union of South Africa.

Figure 4. At Tierberg, in the Cape Province of the Union of South Africa, a graded and grassed waterway protects both terraced slopes and bottomlands.

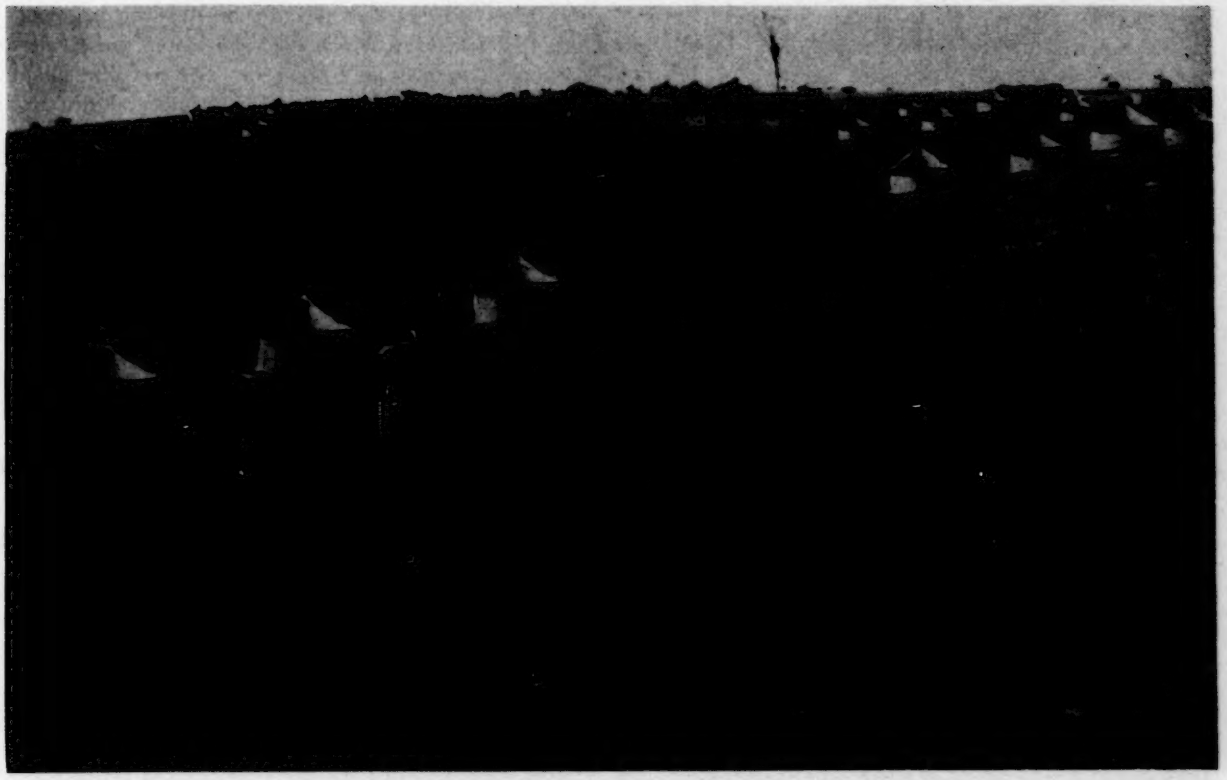


Figure 5. An improved native South African pasture with gully control and dispersal of houses to eliminate kraaling of livestock and encourage good grass cover.

BASUTOLAND—Basutoland Territory (Southern African native state) has nine Soil Conservation Districts staffed by their own soil conservationists. Responsibility for the programs is in the hands of the local chiefs and their appointees. About a third of the country's land has been treated for soil conservation. This is an example of remarkable sustained enthusiasm and steady progress for conservation in a land where, fifteen years ago, many people said, "It is impossible!"

KENYA—In Kenya, in East Africa, there are 11 Soil Conservation Areas, with Soil Conservation Community sub-divisions including both European farmed lands and native reserve lands. Practices had been applied on about 6,000,000 acres at the last report. All areas and sub-divisions are staffed by conservation technicians from the Kenya Soil Conservation Service which was established in 1937.

MEXICO—Mexico has 17 large Soil Conservation Districts subdivided into more than 100 community conservation areas. Technicians of the National Soil Conservation Division are stationed in the districts to provide assistance in planning and applying practices. Public support is excellent, with many civic groups handling educational programs and even helping with grants of money. About 20,000,000 acres have been treated for soil conservation.

VENEZUELA—Five large Soil Conservation Districts, river-basin size, have been delineated by the Ministry of Agriculture in cooperation with state governments as authorized by the National Soil Conservation Law. They are divided into many sub-districts whose Boards of Supervisors are all agriculturists. Technicians of the Department of Conservation and Utilization of Soils provide technical advice and surveys as a basis for farm planning.

COLOMBIA—Colombia now has 12 Conservation Departments sub-divided into 50 Centers of Soil Conservation where farmer and rancher communities work with some 200 technicians provided by the National Federation of Coffee Growers. Surveys, research and conservation planning are done by the Colombia Ministry of Agriculture's Soil Conservation Service. Two large val-

leys, recently opened for settlement and resettlement, are being placed under conservation plans as rapidly as land is occupied.

BRAZIL—The State of São Paulo has 10 Soil Conservation Districts covering the total acreage of the State. Directors of districts are all farmers and ranchers. The Soil Conservation Service of the São Paulo Department of Agriculture has technicians in all the districts. This is a successful state program, with much land already under soil and water conservation and excellent results in increased yields.

Other Brazilian states have their soil conservation programs, but they do not yet have soil conservation districts.

ARGENTINA—In the last two years, three Soil Conservation Districts and about 15 sub-districts have been established, with emphasis on the regions subject to drought. More are being established, and there is a great deal of interest in expanding districts to all the country. Technicians are provided by both the state and the federal governments, while valuable research and survey work is done by the Soils Institute and the state experiment stations.

CANADA—In western Canada (Manitoba, Saskatchewan and Alberta) there are about 65 Community Pasture Rehabilitation Areas governed by local Advisory Committees. The Prairie Farm Rehabilitation Administration, a federal agency, provides technical assistance. The program started in 1937. Some 40,000 to 50,000 individual and small community projects had been completed by 1957.

In one of these provinces, Manitoba, legislative approval has recently been given to an Act which provides authority for formation of soil and water conservation districts by farmers and ranchers. The Act also allows groups of municipalities (local governmental divisions similar to countries or townships) to cooperate in applying complete conservation measures on a watershed basis.

Ontario now has 20 Conservation Authorities, compactly organized and each covering an entire watershed. A two-thirds vote of the people is required to form an Authority. Technicians from the Conservation Service of the Ontario Department of Agriculture staff the Authorities, all of which have been surveyed in detail for extensive conservation planning. Operations on the land have started in most of the Authorities.

* * *

Most of the above programs have tried to follow the United States pattern for soil and water conservation. It has, of course, been a matter of adaptation to fit conditions and thus there are many variations. Undoubtedly, great skill and understanding have been used in making these adaptations in all cases.

There is now widespread cooperation for soil conservation between countries. It is probably to the advantage of all countries to give credit to each for its specific achievements in shaping the soil conservation district idea to its own conservation problems and its own people

Many other countries have soil conservation programs that are functioning without soil conservation districts with various measures of success. But the programs in countries using the district mechanism appear to be profiting by the enthusiasm and awareness that local people have an opportunity to generate in districts.

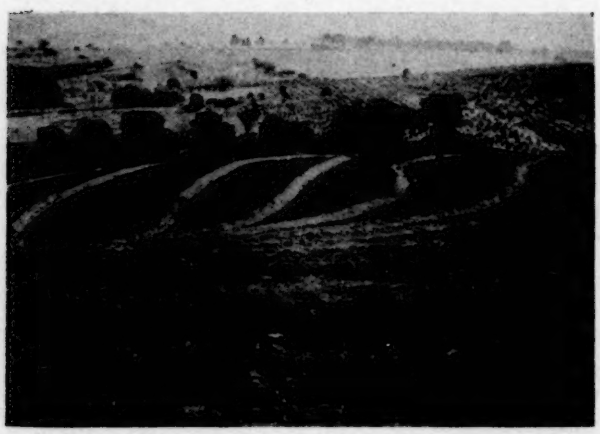


Figure 6. A small portion of a terracing pattern in Sao Paulo, Brazil. Many coffee and sugar cane fields are now terraced.

Figure 7. Strip cropping in Mexico. Maize, considered an essential food crop, is grown with fruit-bearing trees in contour strips on steep slopes.

Microbial and Related Studies of Stubble Mulching

T. M. McCALLA

The use of crop residues for protecting the soil surface against erosion by wind and water creates some different problems (Fig. 1) than those encountered with the plow system. (Plowing is defined as moldboard plowing; subtilling is the use of sweeps to till the soil without inverting it; and stubble mulching or stubble-mulch tillage refers to the system of maintaining crop residues on the surface of the soil.) Since 1937 investigations have been conducted with stubble mulching at Lincoln, Nebraska. For the past three years soil samples have been taken from experimental plots at Cherokee, Oklahoma; Havre and Sidney, Montana; Mandan, North Dakota; and Lincoln, North Platte, and Alliance, Nebraska through the courtesy of the Agricultural Research Service project men located at these stations. The purpose of this paper is to review and summarize some of the microbiological and related observations obtained from investigation of these samples as it applies to the stubble mulch practice with particular reference to the northern part of the Great Plains. A summary of this information is tabulated. Many of the studies reported in this paper have been made on plots at Lincoln now in their 21st year of continuous stubble mulching.

Results of Microbiological Studies

1 *Soil Physical Condition.*

Residues on the surface of the soil decompose largely at the zone of soil-residue contact. Here the supply of oxygen is abundant and the release of carbon dioxide may be easily accomplished (4). Moisture and temperature conditions favorable for microbial mobilization and mineralization of mineral nutrients are different on stubble mulching than on plowing. Residues left on the surface decompose more slowly than when plowed under (6,21,22). Between rains the surface soil remains wet for a longer time under the mulch, and in the spring of the year the soil does not warm as rapidly. Moisture and temperature conditions fluctuate less under mulch than on bare soil. This may be less stimulative to microbial activity than a fluctuating condition. Drying may throw the cells into a resting or spore stage. When moisture is again available, new vigorous vegetative growth may be produced causing a more rapid mineralization of the soil organic matter.

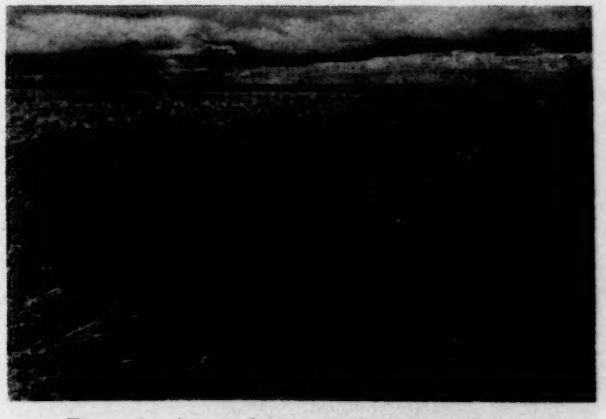


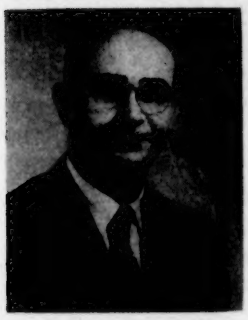
Figure 1. A typical wheat field in the study area, showing stubble after first tillage operation.

Stubble mulched soil is cooler than plowed soil in the spring and early summer (12,14). During the latter part of the summer there is a temperature inversion in the two systems and the stubble mulched soil is warmer until late in the winter. This information indicates that on mulched soil, corn should be planted as late as possible so that the growth period of the corn will coincide with the time when soil temperatures are most favorable for nitrification and growth.

Soil aggregation on stubble mulched land is usually increased over unmulched land in the surface inch of soil (9,10,11,13). This appears to be due to an increased concentration of decomposing organic matter in this part of the soil (20). This makes the soil more porous and receptive to rainfall, particularly when residue cover is present (5,9). Soil aeration and volume weight usually are not different with the two tillage systems.

2 *Soil Chemical Condition.*

Soil analysis shows that ammonia loss is usually slightly higher with sweetclover residues decomposing on the surface than when these residues are plowed under. With wheat straw there is no measurable difference between the two tillage systems with respect to



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ammonia loss. The nitrite content is low and similar under the two tillage systems, regardless of the nature of the residue. A large number of soil samples, taken over a period of years on a number of grain and legume rotations at Lincoln, showed that the nitrate content in the field was 5-10 per cent less with stubble mulching (1,7,16). Some fall samplings have shown higher nitrate content on the mulched land. This difference is probably due to higher temperatures on the mulched plots in the fall and to higher supply of easily nitrifiable material. When soil samples were brought into the laboratory and incubated at optimum moisture and temperature, there was no difference in nitrification rate. This observation indicates that the moisture and temperature differential of the tillage systems encountered in the field may be largely responsible for nitrate content differences of field plots.

Organic matter, weak hydrochloric acid soluble phosphorus (26), and pH are higher in the surface inch of stubble mulched plots. These differences are largely the result of the residues decomposing at the surface of the soil, mineralizing the organic phosphorus and releasing bases which tend to increase pH. The residue decomposes more slowly in the stubble mulch system probably because of alterations in the microflora and in levels of moisture and nutrients. There is no appreciable build-up of total organic matter in the stubble mulch system.

3 *Plant Composition.*

Mulched corn, oats and wheat take up slightly less nitrogen (25) but about the same amounts of phosphorus, potassium, calcium and magnesium as corn, oats and wheat on plowed land. The available amounts of these nutrients, with the exception of nitrogen, are about equal under the two tillage methods. The lack of soil nitrate can be, to some extent, made up by applying nitrogen fertilizers. Foliar symptoms of magnesium deficiency were noted during one year; otherwise there has been no visible evidence of minor elements deficiencies.

4 *Biological Conditions.*

Crop yields on mulched plots may tend to be higher in dry years and lower in wet years than on plowed plots. When adequate residues are present the number of microorganisms, such as bacteria, fungi and denitrifiers, is higher in the surface inch on mulched soil than on plowed soil (2). Organisms such as earthworms and nematodes are favored by the cool and moist conditions frequently obtained with stubble mulching (24). There appears to be no effect on the number of Azotobacter or on legume bacteria and nodulation.

In a study of the fungi of decomposing straw, certain types of fungi, such as Fusarium and *Stachybotrys atra,* not only decompose residues more rapidly, but also produce a more highly aggregated soil (Fig. 2), (3,5,15,23). In some cases, with heavy residues, it is desirable to speed decomposition. Decomposition rate can be increased some by the addition of nutrients, such as nitrogen. In most cases residues decompose too fast, and it is difficult to maintain adequate cover (Figs. 3, 4 and 5), (6,8,18). Some progress has been made in increasing the durability of mulch by applying a chemical such as sodium pentachlorophenolate.

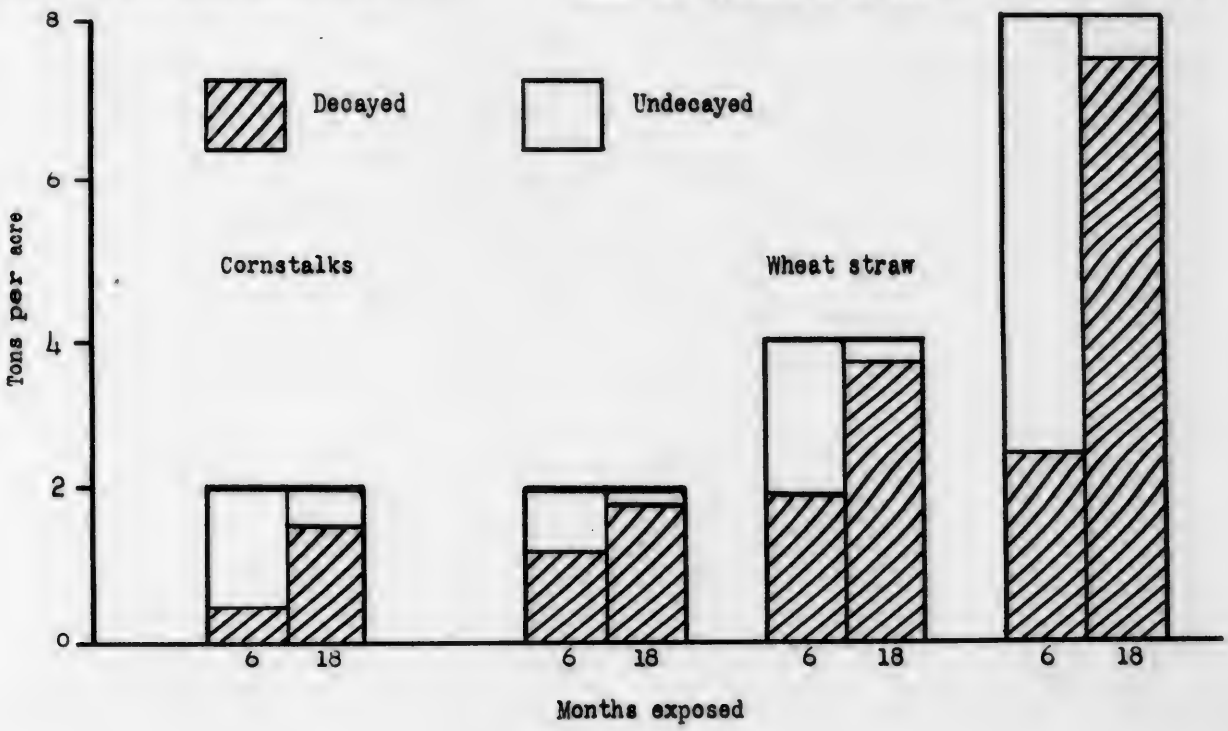
Figure 2. Fungi growing in soil and stabilizing it. The mycelium threads bind the soil particles together. Also some gums, or other organic substances exuded by the fungi, aid in cementing the particles together. (x12).

Figure 3. The appearance of wheat straw with some common soil fungi decomposing it in a mulch application in the field. (x14).

Some study has been made of substances contained in residues or produced by microorganisms that affect germination and growth of crops. Sweetclover has been found to contain a substance, probably coumarin, that inhibits the germination and growth of corn (17,19). Some microorganisms produced substances in laboratory studies that were capable of changing the direction of root growth and limiting top growth of corn.

Figure 4 *(above)*. Residue remaining after 18 months of decomposition in the field of an 8-ton per acre application of straw mulch applied to corn.

Figure 5 *(below)*. Decomposition of corn stalks maintained on the surface with 2-ton rate of application, and of wheat straw with 2, 4 and 8-ton rates of application. Observations were made six and 18 months after application in the field.



5 *Plant Diseases and Insects.*

No differences have been observed between stubble mulching and plowing on their effects on insects and diseases affecting crops, although this aspect has received insufficient study.

Summary

The stubble mulch system appears to offer great possibility for the control of water and wind erosion. To make it a more effective practice there are a number of factors affecting crop yield, such as nitrification, denitrification, kinds of microorganisms, and decomposition products, that should be further investigated. More knowledge of these and their interactions with each other should provide some basis for modifying and improving the practice.

SUMMARY TABULATION

EFECT OF STUBBLE MULCHING ON SOME CHEMICAL, PHYSICAL AND BIOLOGICAL PROPERTIES OF THE SOIL AS COMPARED WITH PLOWING

Type of Determination	Stubble Mulch Compared to Plowing
Physical	
Aeration	No difference.
Volume weight	No difference.
Aggregation	May be greater in surface inch of soil.
Temperature	Cooler in summer—warmer in winter.
Moisture	Variable—may store more moisture and to greater depth.
Chemical—Soil	
Ammonia loss	Slightly higher with legume residues.
Nitrites	No difference, and low amount present.
Nitrates	About 5-10% less.
Nitrification rate	No difference.
Organic matter, pH, HCl soluble phosphorus	May be slightly higher in surface inch of soil; in 1-6 inch depth no difference.
Chemical Content of Plants—Oats, wheat, corn	
Nitrogen	Slightly less.
Phosphorus, Potassium, Calcium, Magnesium	No difference.
Minor elements	No visual difference, except magnesium decrease in one year's results with corn.
Biological	
Crop yields	Variable—may be higher in dry years and lower in wet years.
Bacteria, Actinomycetes, Fungi, Earthworms, Nematodes	Greater number of organisms in surface inch with residues on surface.
Denitrifiers	May be higher number in surface layer of soil.
Azotobacter, Legume bacteria	No difference in numbers or effect on nodulation.
Decomposition of Residues	Slower on surface, but still difficult to maintain cover. Residue preservation (such as with sodium pentachlorophenolate) looks promising.
Fungi decomposing straw residue	*Penicillum, Fusarium, Alternaria, Hormodendrum, Trichoderma,* and *Chaetomium* as a group decomposed straw more rapidly than *Aspergillus, Rhizopus* and some species of *Trichoderma.*
Products in residues or produced during decomposition that affect germination and plant growth	Present in some residues such as sweetclover, and may be produced by microorganisms from other kinds of residue.
Insects and Plant Diseases	No differences observed.

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Meeting Washington's Small Watersheds Problems

FREDERICK A. MARK

WATER HAS THE POTENTIAL of being man's greatest enemy or friend!

When precipitation falls it has a potential for creating benefits or causing damage, and in many instances does both. One goal is to maintain watersheds in such condition that the soil will be stabilized and vegetation will be maintained in such density and vigor that the maximum rate of infiltration and storage in the soil will be achieved.

To what degree watershed land-treatment measures will achieve this purpose depends upon a great many things and varies in watersheds. In areas of heavy to relatively heavy precipitation, many natural conditions, as well as the pattern of precipitation, necessitate surface storage facilities if damages are to be prevented and maximum beneficial use of available precipitation is to be achieved.

Problems of small watersheds of Washington, as in most other states, involve the prevention of damages, the maintenance of high water quality, and how to make maximum use of the water resource through management, including land treatment and various kinds of storage facilities, to provide the greatest dividends.

While the technical problems in reaching such objectives are by no means simple, economic justification is often even more difficult.

National legislation defines small watersheds as those of 250,000 acres or less. Basically sound results can be assured only by the adoption of sound soil and water conservation measures on all the land in the watershed. As a background we have many years of sound conservation-farming methods to aid in the development of intelligent watershed programs. Watershed research data in the West are limited and often those available are not adaptable to specific selected watersheds. Much yet remains to be learned but many basic concepts are available for intelligent use.

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Small watershed programs are not new in Washington. Extensive work has been carried out for many years by soil conservation districts cooperating with flood control, drainage and other special-purpose districts. Agricultural conservation program-pooling agreements are sometimes an incorporated part of the plan. The state Department of Conservation, Flood Control Division, carries out a cost-sharing flood control program with many special-purpose districts and with county and city governments. Soil Conservation Service personnel have had an active part for years in the organization, planning and engineering supervision of this work. These efforts are state-wide in scope and have been used on nearly all kinds of land.

Public Law 566, authorizing small watershed projects, is, therefore, another means of supplementing present methods of attacking the problem.

The state has approved over 20 applications for assistance under P.L. 566 as amended. Watershed work plans have been completed on five watersheds. Congress has approved three for operations. One project is now well along on the installation program and another is completing details for contracting. Two work plans are now awaiting Congressional action and three other work plans are in advanced stages of completion (as of late 1958).

As of June 30, 1958, operation of one pilot watershed protection program on Mission Creek was completed. This was a joint SCS, Forest Service, Soil Conservation District sponsored program.

It is evident local organizations have been quick to recognize the benefits and advantages to local organizations available under the federal Small Watershed Act.

All of the programs approved by Congress have been multi-purpose programs, and all those pending approval and in the planning stage are multi-purpose programs with the possible exception of one.

Studies Begin With Climate

Any study of watershed problems and their possible solutions must begin with climate and the study of local storm patterns. While the effects of man's actions are often drastic and sometimes tragic, they are subject to rapid change. Climate on the other hand, if appropriate records are available, can be studied on the basis of longtime averages and long or short climatic cycles. Climatic records provide a basis for studying cause, effect, and development of needed remedial programs.

Unlike most states, Washington's extremes of precipitation are not of much lesser spread than the nation as

a whole. It has a greater range in precipitation than any other state. One national extreme—the highest recorded annual precipitation—exists in Washington and the range is from the highest local annual average of 146.0 inches at Wynoochee to a low of 5.93 inches in the lower Columbia Basin. Snow on the ground ranges from a few inches to exceeding 30 feet, with accumulative annual depths up to 66 feet in the Cascade Mountains.

Another climatic aspect is that the growing season varies from 80 to over 240 days. The warmest part of the growing season occurs during the period of low precipitation. Statewide, the summer growing season is the period of lowest precipitation.

Physical Features

Elevations vary from sea level to 14,408-foot Mount Ranier. Vegetation varies from sparse annual grass and desert shrubs to dense rain-forest stands of hemlock and fir.

Soil parent materials vary from moderately acid to highly alkaline and originate from lacustrine, aeolian, glacial, alluvium and residual deposits. Soil depths vary from less than an inch to 30 feet or more. Types vary from extremely coarse sands to highly plastic clays.

Physiographically, the state is broken into six major provinces: the *Blue Mountains* in the southeast, the *Okanogan Highlands* in the northeast, and *Columbia Plateau* in the south central, the *Cascade Range* extending north and south a hundred or less miles inland from the Pacific Ocean, the *Puget Sound* trough lying between the Cascade and the Coast ranges, and the *Coast Ranges*.

These physiographic provinces have large variations in climate. Extreme variations in precipitation, temperatures and storm patterns occur statewide. Rain shadows plague the watershed planner who often has only extensive recorded precipitation and stream flow coverage.

The principal drainage pattern consists of the Columbia River entering the northeast corner of the state and flowing south through the eastern half of the state and then flowing west along three fourths of the state's southern boundary to the Pacific. Numerous relatively short, fast-flowing rivers outlet from east and west into the Columbia. The rivers west of the Cascade Range are generally shorter, and, except for a few in the southwest portion, flow directly into the Pacific Ocean or Puget Sound. Those west of the Cascades leave the mountains as high-gradient streams and, entering the flood plains, become sluggish and cause sediment and drainage problems. Watersheds considered legislatively as small are

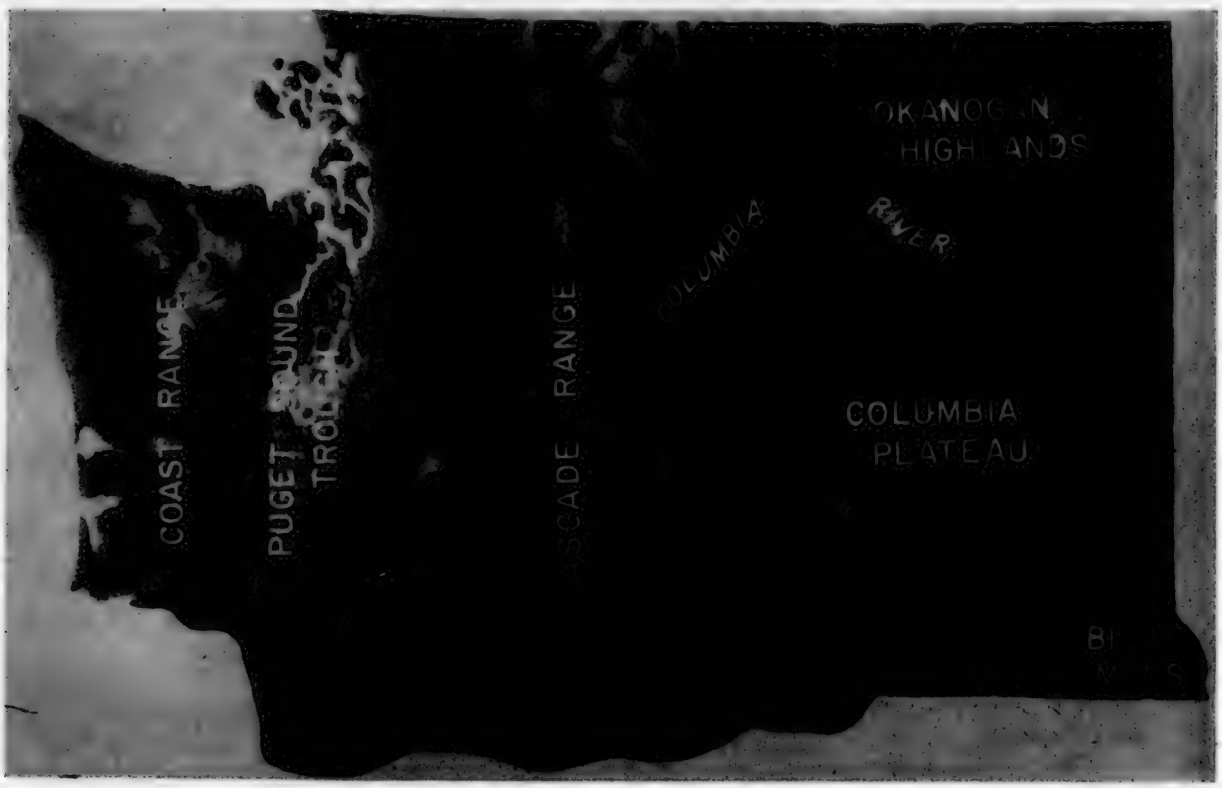

Figure 1. Physiographic Provinces, Washington.

usually the upper tributaries of these rivers. These tributaries are generally relatively short, high gradient streams, often deeply incised above their flood plains.

I. PROBLEMS IN WESTERN WASHINGTON

Floods

The climate and physiography of the western part of the state result in high peak flows during the winter and spring months with generally low to very low flows during the summer and fall months Floods are principally the result of precipitation in the form of rain. East of the Cascade Range, early winter floods may occur occasionally, but normally are the result of snowmelt. The most severe condition results when below-normal temperatures in the spring delay snowmelt over a wide range of altitude conditions. The catastrophic floods on the Columbia in 1894 and 1948 resulted when a swift rise in temperature accelerated the late snowmelt. In some tributaries unseasonal heavy precipitation increased runoff volume.

The season of highest agricultural water demand is generally the season of low streamflow. Broadly speaking, Washington has an abundant water supply. Yet most agricultural areas, except the Columbia Basin Reclamation project, have a growing-season water shortage. Ironically, scarcely a dozen storage reservoirs exist in the state for single- or multiple-purpose use that could be placed in the major or semimajor class. Small community-type irrigation and flood-retention reservoirs are almost nonexistent although runoff supplies are abundant and many reasonably good storage sites await development.

Economic Limitations

There are several basic reasons for this. One is local economy. In many instances local economy cannot justify the relatively high cost per acre foot of storage for single- or multiple-purpose use. Streams generally have high gradients and carry extremely large peak volumes, necessitating spillway capacity and construction costs out of proportion economically to storage capacity. The combination of these elements places many needed water-retarding structures outside the realm of present economic feasibility whether for single- or multiple-purpose use. Likewise, appreciable areas of flood plain exist only near the mouths of such streams, limiting drastically the area of benefits.

In other instances, particularly on coastal streams emptying into the ocean or Puget Sound, winter and spring flood volumes are so great diking is at present practicable within limits. These streams usually carry high bedloads and as low gradients are reached at the flood plain, bedloads are dropped resulting in damaging diversions across farmlands. On many of these flood plains, intensive agricultural production would be possible if spring flood protection were possible. Technical designs for long-range complete protection with economic justification on a project basis are often difficult to attain since maximum flood protection cannot always be justified on the present level of economic development. In such cases a level of flood protection must be chosen commensurate with anticipated benefits and practical operating procedure. Such compromise solutions are not easily determined nor the project easily designed, particularly when local precipitation and stream flow records are nonexistent or inadequate.

Figure 2. Lack of adequate instrumentation for water stage recording is a serious problem over most of the state to watershed planners.

High Bedloads Carried

Another problem on the coastal area is the high bedload of glacial material usually carried by these streams.

Figure 3. Glacial debris from the mountains which are heavily forested has filled this watercourse. In two or three years it will require a similar operation.

Figure 4. Choked up floodwater channels result in poor quality pastures and seasonal flooding.

Figure 5. Flood channels, properly constructed, serve for flood prevention and drainage.

High bedloads are usually caused by a combination of several factors, some of which have been accelerated by man.

High-gradient streams passing through glacial-till soils in high flood stage, even under substantially virgin-cover conditions, can be expected to carry high bedloads. Logging practices of the past have left considerable areas with poor ground-cover conditions and stream channels intermittently clogged with logging debris. The existence of such debris results in channel whipping and subsequent increase in bedload. The debris also causes the formation of temporary dams, sometimes to relatively great heights, which under pressure of their own weight and subsequently peak flows, may suddenly collapse, releasing tremendous volumes of water and debris which in turn take out similar dams downstream and eventually cause havoc and add greatly to damage-costs on the flood plain. This condition occurred on numerous streams in 1948 associated with the great flood on the Columbia.

Resultant damages to the flood plain, whether from expected storms or through intensified conditions caused by situations outlined above, involve inundation of large areas. Flood damages include killing of pasture plantings by prolonged inundation and sediment deposition, loss of highways, bridges, fences, homes, and filling flood plains and drainage channels with debris.

The removal of debris dams in the upper watershed, if not physically impractical because of terrain, is usually economically questionable. The existence of such structural hazards generally complicates the feasibiity of constructing floodwater-retarding structures, including debris basins, because of the effect of floating debris upon spillway design and costs and the tremendous volume of potential sediment. As a result, flood-prevention remedial measures, insofar as structures are concerned, must usually be limited to improved channel capacity across the flood plain with subsequent expected high annual maintenance costs. Unless the flood plain involves an appreciable area of high-value land or other improvements subject to damage, economic justification is probably not possible.

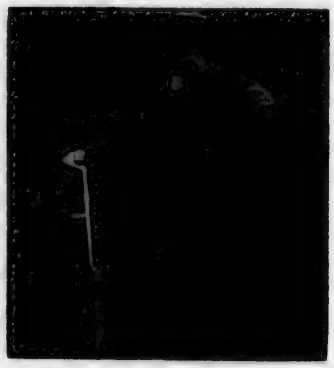

Figure 6. Planners consider effects on soil drainage when extensive channel works are planned for bottomlands. Here ground water recordings are studied for a year.

Channel Problems

In many instances flood channels can be designed to serve two separate purposes, flood prevention and drainage. To do so usually requires a channel design altered to meet the dual use. For discharging floodwaters, the maximum depth needed for drainage outlets may not be required; the channel is therefore altered in design to provide depth for drainage and capacity for both drainage and floodwaters. Such designs are nearly always more economical than separate channels for each purpose.

Many of the rivers in western Washington may be waded by a boy in the summer but have depths of 30 feet or more at floodstage. At this time they may or may not inundate adjacent land. The Saar Creek P. L. 566 project, presently under construction in Washington, experienced for the first time in recorded history a dry streambed in September, 1958. At peak or near-peak stages and when slightly below overflow stage, the erosive action on banks is serious. Because the flood plain soil may vary greatly, the presence of highly erosive material, frequently of glacial origin, at some point in

Figure 7. Heavy rock riprap on streambanks after shaping is a good, but costly, protective measure.

Figure 8. Dikes to protect highly fertile bottomlands are effective, but costly, control measures.

the river may result in forming of new bars and the river changing its course in a few hours.

The cost of well-designed, properly-installed river revetments on such rivers is extremely great. Efforts to get some protection by inferior designs, poor installation, or by treating scattered portions of the channel, have too frequently resulted in loss of the investment and, in some cases, accentuated the acuteness of the problem. There appears no easy or low-cost solution to such problems. Evidence indicates joint local-state-federal programs under existing legislation can furnish means for installations on adequate reaches of rivers to insure sound, permanent protection, providing local units of government recognize the need for annual maintenance and possess the legal machinery and incentive to act.

Land Treatment Measures

On the west side of the Cascade Mountains, where there is no native rangeland, land treatment measures are needed, principally on bottom lands, to prevent overflow scour and to improve drainage. Where prolonged inundation is experienced, grass and legume mixtures for hay and pasture must be carefully selected. On bottom lands, land-treatment measures are therefore principally limited to improvement of grass and legume stands and to open and closed drainage systems.

Upland areas vary considerably in condition and use but are predominantly in brush, second growth, or virgin forest. The use of upland soils for row or other cash crops is very limited. Cleared land is largely in hay or pasture. Above foothill elevations, second growth or virgin forest prevails. In watersheds where fires have denuded large areas, and particularly where no seed trees remain, sediment and fire-produced debris accentuate the runoff problem. Here thin soil profiles become saturated even before late major storms occur.

Practices found necessary to reduce sediment and debris movement to a minimum on all kinds of forest lands include properly engineered roads, with acceptable grades, properly placed culverts and other road-drainage features. In the dominantly Douglas-fir forests, block cutting is a primary practice with acceptable secondary practices which include hill loading rather than ravine loading with its resultant channel clogging. After logging, immediate reestablishment of a fir stand by natural seeding is of great importance economically as well as for watershed protection. Abandoned roads are frequently seeded to grass to hasten soil stabilization. Fire protection is a must item, but its present level of adequacy is very good. Artificial seeding or planting is also used to re-establish stands of fir, especially where natural seeding has not been effective.

Figure 9. Channel whipping often caused by logging debris may change a river course suddenly and lead to land loss and destruction of farmsteads.

Research Limited

As pointed out in an article by E. N. Dunford in the January, 1958 issue of this JOURNAL, research in watershed management is in its infancy. Extensive watershed operations have preceded research for many years. The article further points out the apparent lack of research

information and need for accelerating its availability.

Local organizations have been cognizant of the need for useful information on which to develop local programs.

In 1953 the Washington State Association of Soil Conservation Districts asked the Soil Conservation Service to carry out a pilot study on land and water resources in Whatcom County in northwestern Washington. The Whatcom County Soil Conservation District published an SCS report, prepared cooperatively with the state Division of Water Resources, in October, 1953 *(Land and Water Resources Survey, Western Whatcom County, Washington)*. This report outlined water resource problems, possible water resource developments and associated flood prevention and watershed protection aspects.

Dunford's article highlights the physical elements involved, but of major importance are the economic aspects, particularly on private lands. Physical need is one thing but economic justification quite another.

Other water and watershed management problems in western Washington include: Maintenance of permanent cover on land-capability classes IV, VI, VII, and VIII; maintenance of firm municipal, industrial and agricultural water supplies; salt intrusion near coastal areas; abatement of stream pollution from sewage and industrial wastes; land drainage and reclamation of tidal flats; and development of a state water policy. Such a policy should be administered by an unbiased commission to determine priority of water use and development, consistent with, and in consideration of, all needs.

II. PROBLEMS IN CENTRAL AND EASTERN WASHINGTON

The watershed problems of central and eastern Washington are influenced by many different climatological conditions, other physical factors, and uses of land.

Flood conditions occur east of the Cascade Mountains and other mountain ranges in eastern Washington principally as a result of melting snow, but also to an appreciable degree in some areas from late winter and early spring rainfall. Snowmelt occurring late in the spring, and especially when associated with above-normal temperatures accompanied by rainfall, may result in very high flood damages. On a hilly or rolling area of intensive cultivation such as the Palouse in south-central and southeastern Washington, chinook-type storms cause rapid snowmelt and are sometimes accompanied by rain. This condition nearly always causes severe damage to land and many private and public improvements. In other cases early spring rains on frozen, tilled soil, with few if any protective measures, result in peak flows saturated with topsoil.

Land Treatment Is First Need

Throughout central and eastern Washington occur large, low-elevation areas of rolling or undulating rangeland. Most of this type of land has been overgrazed for many years. Although range improvement is slowly taking place, few areas approach cover conditions approximating climax vegetation. Flash floods from snowmelt, rainfall, or a combination of both are relatively common. Improvement of vegetation and improved range man-

Figure 10. This highly productive area of western Washington may be flooded several times a year by rivers heading in the high-rainfall area of the Cascade Mountains.

Figure 11. Small trade centers in eastern Washington wheat area are usually located on the floodplain of a small stream. Strip cropping and associated land treatment practices are highly effective watershed protective measures.

agement are principal methods of alleviating flood conditions. On the Palouse and central Washington drylands, which produce principally cereal grains, a combination of land-treatment measures including conservation crop rotations, stubble mulch, special tillage, strip cropping and land retirement, with some special structural works such as channel improvements, field diversions, and erosion-control dams, are very useful remedial measures.

In some watersheds where forest and grassland are well managed and good conservation is practiced on cropland areas, storage for flood prevention or multiple-purpose use is practicable and some feasible sites exist. The greater part of the dryland crop-production area has associated sediment problems so severe that floodwater-retarding structures are seldom justified due to short life by siltation. When proper land treatment is applied, the sediment problem is considerably reduced. On the Columbia Plateau, whether range or cropland, land treatment is the principal practical remedial approach augmented to a lesser degree with simple works of improvement. Actually, if proper land-use measures were applied, only severe storm conditions would result in serious runoff.

Many Practices Involved

East of the Cascade Mountains, major land-treatment measures are needed on all kinds of land use.

On forest lands, sustained-yield cutting practices, deferred-rotation grazing and fire protection are the most

Figure 12. In eastern Washington wheat lands, grass stabilized waterways and land treatment practices on the slopes are important watershed protection measures.

Figure 13. Basin listing with stubble mulch farming are helpful in preventing floods and conserving water on central Washington wheat lands.

important measures. Much of the forest land, both public and private, is grazed and serves a dual-use purpose. In areas not grazed by domestic livestock, game herds may necessitate close management to insure adequate ground cover.

Grass lands in the open range category have experienced 50 to 75 years of over-use. Acceleration of deferred-rotation grazing wtih associated measures of water development, reseeding, proper stocking, and fire protection will greatly reduce runoff and sediment movement. The need for these measures is generally common to thousands of acres of both public and private range lands.

Cropland flood prevention and watershed protection measures are principally but not completely associated with the annual and summer fallow cereal grain areas. In this category are about three million acres, devastating sediment producers for 50 or more years.

Control measures are dominantly concerned with land-treatment. These include: retirement of all Class VI and VII land now in crops to grass; establishment of long grass-legume rotations, or retirement from cultivation of Class IV land; universal use of stubble mulch; incorporation of grass or grass-legumes in the rotation as climatic conditions permit; field strip and contour strip cropping on all applicable slopes; and such other measures as are locally needed, including special tillage and waterway development and management.

On farms where the applicable combination of these measures has been properly managed, water and soil loss has been virtually eliminated.

Statewide, county and state highway departments are becoming more aware of the need for sediment and drainage water control measures. The needs are principally seeding and sodding of cuts and fills and drop inlet and outlet structures for proper grade control.

There is much good land requiring supplemental irrigation water, and some land adaptable to irrigation if water were available. Numerous towns formerly depending on groundwater for municipal supplies are alarmed at the rate of groundwater depletion and are looking toward surface storage sources. Some of these towns are directly concerned and interested in watershed protection since many of them are situated on small river bottoms and suffer flood damages frequently.

Snowmelt Problems

Westward to the slopes of the Cascade Range, a large number of both small and relatively large rivers discharge into the Columbia and its tributaries. These streams rise at the crest or near the crest of the Cascade Mountains, which hold most of the precipitation as snow until spring. Winter accumulation of snow has been recorded as high as 66 feet, with consolidated snowpack in early spring up to 30 feet. Using an estimate of 3.6 inches of water per foot of snow, this nine feet of water involves both highly beneficial and hazardous factors. If the snowmelt rate is normal, runoff will not be critical; infiltration in the soil will result in firm streamflow late in the summer beneficial to irrigation, aquatic life, recreation, range and forest growth, hydroelectric power, navigation and other purposes.

Figure 14. Some floods in eastern and western Washington are the result of heavy snow pack. In late spring or early winter rain may aggravate the situation disastrously.

On the other hand, if melt is first retarded, then swiftly accelerated by sudden warm temperatures sometimes accompanied by rain on the snowpack, runoff will be increased and major flood damage will be experienced. The principal floods in this area originate in the mountains, and, if augmented by delayed runoff from lower foothill areas, damages are proportionately greater.

Even under good management practices on forests and rangelands, disastrous floods can develop. To a degree this might be illustrated by the worst recorded flood on the Columbia which occurred in 1894 when much of the watershed was in a virgin and semivirgin condition.

Storage Sites Limited

On some streams flood peaks can be decreased by dams and channel improvement. Good reservoir sites for retention of floodwaters, or other purposes, are not easily found. Many potential sites must be discarded under the present level of economic development; others, because of high cost per acre foot of storage. In other cases suitable sites from a construction point of view, but with limited storage, must bypass such large volumes of water during flood peaks that spillway costs are out of proportion with storage capacity, or the effects of storage on the flood peaks at the flood plain are small.

On many of the tributary streams eligible for assistance under existing authorized federal assistance programs, the level of economic development is so low, or the area subject to damage so small, the relatively high cost of storage cannot be justifed for the benefits to be derived.

In other areas, and particularly the Okanogan Highlands, soils are largely of glacial origin and are generally not suitable for water-impounding structures. Extremely high streamflows from snowmelt are experienced here, doing frequent heavy damage to farmlands, particularly orchards. Adequate streambank-protection measures are costly and, except where appreciably large areas are protected, cannot be financially justified.

Figure 15. Sediment damage to orchards is often experienced along the eastern base of the Cascades and the Okanogan Highlands as a result of spring floods and summer cloudbursts.

Basic Information Lacking

Other problems concern lack of basic information. Much that exists is scattered throughout the records of many local, state and federal agencies. While fine publications with many years of records are available on climatological and streamflow data, they exist principally as adaptable to design of works of improvement on the large rivers and near main centers of population. In the inland areas such data are more likely lacking, and the watershed planner in small watersheds usually has inadequate data, based, at best, on short-period records. Yet, he must plan works usually involving an appreciable local cost. He cannot afford to overestimate or to underestimate costs in a latitude that might not be so serious under more favorable economies.

Everyone Is Concerned

In Washington, it is quite probable that about half of the flood damages occur on the upper watersheds of small streams. The direct and indirect damages affect the whole state's economy, and the need for further recognition of this is important.

Everyone living in a watershed and many outside a watershed are influenced by its local benefits or damages. All owners or administrators of land, public and private, must have an interest in the problem. The Watershed Protection and Flood Prevention Act, Public Law 566, passed by the 83d Congress and amended by Public Law 1018, 84th Congress, recognizes this principle. Since much of the public land in Washington is National Forest land, this problem is resolved to an appreciable degree within the Department of Agriculture. Forest Service personnel work closely with Soil Conservation Service personnel in carrying out field examinations, preliminary investigations and work-plan development in accordance with departmental policies. Similar situations affecting large blocks of state lands or large blocks in private ownership still remain to be resolved.

The Watershed Protection and Flood Prevention Act recognizes certain specific responsibilities and duties of state government in the program. The Department of Conservation in Washington, to which these duties were delegated by the Governor, is well tooled to cope with its responsibilities. State laws providing for the organization and action of various kinds of water development and management organizations appear at the moment adequate: there are 600 separate organizations, not including soil conservation districts, in the state. State flood-control funds are also available for cost-sharing on certain types of work, and in other cases low-interest,

long-term loans are available. Applications for assistance under Public Law 566 must have state approval.

Most small watershed programs, with or without state or federal participation, are sponsored by local soil conservation districts. Districts have the means to aid in the application of land-treatment measures. They normally take leadership in program organization. Local flood control, drainage, or other special-purpose districts, usually become the contracting and operating organization.

Effective Leadership Important

In some watersheds, where single- or multiple-purpose projects are needed and assistance has been requested, no formal organization exists which has the authority to raise funds by assessment or other legal means, secure rights-of-way, and operate and maintain completed works of improvement. In some cases local action is slow or not forthcoming at all to provide this "authority" for a successful program. The public demand within the state for assistance on various kinds of watershed problems necessitates that prior aid be made available to those organizations that are in the best position to aid in program development and to operate and maintain the work. One unique thing about programs developed under the Watershed Protection and Flood Prevention Act is that such programs are local programs developed with state and federal financial and technical assistance. Such programs must be compatible with all state laws and regulations.

Figure 16. There are relationships of this "flood-breeding" country in the Cascade Range to . . . .

Figure 17. . . . . flood plains in the lower elevations. Damages on the Marshland and French Creek watersheds, shown almost totally inundated, amounted to several hundred thousand dollars. P. L. 566 plans are now in a final stage of completion for these watersheds.

Figure 18. Destructive forces of wind and water are at work in this six-inch annual precipitation Columbia Basin province. The attempt being made to trap sediment with dams illustrates the folly of neglecting proper land treatment throughout the watershed.

The Land Use and Conservation Program at Harvard

AYERS BRINSER AND HUGH M. RAUP

THE PROGRAM of training and research at Harvard University in the development and use of renewable natural resources is an outgrowth of about two decades of experience. Under the control of the University's Graduate School of Public Administration, it has thus far been designed primarily to serve students who come from the public services.

Any program of this nature needs to test new concepts and assumptions. It must deal with materials derived from various disciplines, and must therefore find ways of breaking through the departmental boundaries that are now so much a part of academic life. Further, it must find personnel within these disciplines whose interests and aptitudes will enable them to take an active part in a field of inquiry containing much that is outside their ordinary fields of activity. Another fundamental requirement of such a program is that of maintaining rigor in a synthesis of material and ideas from these various disciplines with their different theoretical systems and techniques of analysis. To design a consistent conceptual framework that is relevant to the issues of resource use and development from these diverse sources requires a carefully thought out philosophy of method.

The Purpose of the Program

The efficient use and development of renewable natural resources has become increasingly important over the years. This efficiency depends on successful integration of information from two broad fields. The physical and biological possibilities embodied in a resource are defined by knowledge of its characteristics that is derived from the natural sciences. A constant flow of materials and ideas is needed from research in such fields as biology, soils, geology, and engineering if management decisions are to have a foundation in reality. Assessment of these possibilities in terms of economic and social values is essential before management decisions can be made in actual situations. In turn, research in the areas of economics, government, law, history and business provides equally important sources of ideas essential to satisfactory assessment of the physical and biological possibilities of resource use and development.

The past relationship of man to the resources of land, water and forests shows many dislocations. Whether these dislocations are concerned with publicly or privately controlled natural resources, and whether they involve shortages or surpluses, they need for their solution some method by which existing knowledge from both the natural and social sciences can be brought to bear at points of effective action. Correlative thinking is by nature extremely complex, and involves the problem of multiple interacting variables. The best that can be hoped for are partial solutions based on developing an analytical framework that will enable us to recognize and interpret coincidences among relevant patterns of fact.

The principal need is for men who can think correlatively with materials and ideas from many phases of the natural and social sciences—men whose training goes beyond specialization. The present program attempts to provide the basis for a synthesis of the relevant data from the natural sciences with the analytical methods of the social sciences. The program avoids specialization in its training and research. It aims not at complete solutions of resource problems, but rather at statements of these problems in a form that will make partial solutions possible, considering the developing state of our knowledge.

The Role of Research

A necessary characteristic of the program is that it contains research focused upon actual problems in the field of renewable resources—problems that are being studied currently. The unifying principle is not in the formal organization of subject matter in terms of departments and courses, but rather in direct attacks upon research problems which serve to integrate ideas and materials derived from many sources. It is essential that if the program is to be effective it must be founded upon such an attitude of inquiry into the fundamentals of management and use of the resources. Further, it is necessary that such research inquiry should have continuity and stability, and that it be closely integrated with the training program.

To meet these requirements, the research utilized is in the general fields of both the natural and social sciences. In the first, the objective is to assess the elements of productivity of natural resources. At the same time

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repeated investigations are made of the natural limitations upon proposed resource use. A major objective of research in the social sciences is to evaluate the data of productivity and to find methods of directing investment in resources so that the returns will be satisfactory to both private and public owners. A parallel objective is to design and test institutional structures that will support such investment and at the same time be consistent with the political and social objectives of society. Materials for this research are on every hand, and are being exploited currently by the Seminar. Papers written by former students are being used as the groundwork for continuing exploration. Connections with these earlier students bring to the Seminar information on new problems, thus providing lines of communication between research at Harvard and its application in the field. Concentrations of former students in various parts of the United States can also provide subsidiary centers for the study of problems outside New England.

One specific field of research that has emerged from this general pattern is the study of the concept of the planning unit. The planning unit is defined as an *ad hoc* organization of operating units formed by their concern with common problems and with the objective of making possible the more efficient development of the natural resources within a designated area. Here the range of issues and objectives includes and goes beyond those considered in operating unit analysis. Three examples of this research are: (1) An investigation of three watersheds, the Ash Swamp, the Walloomsac and Johnson Creek. The problems analyzed have included flood control, the development of water resources, and stream pollution; (2) An analysis of a forest area in Grafton County, New Hampshire; and (3) The development of a model law for creating an effective state Department of Conservation in Massachusetts.

The Curriculum

A fundamental purpose in the design of the curriculum is to make available for training and research the facilities of the various schools in the University. Thus there is flexibility with regard to course programs, so that both faculty and students have free time for individual research. Likewise, provisions are made for alternative courses to serve particular student needs. Most of the previous academic training of the students has been in the natural sciences. Because their work at Harvard is in large measure based on material from the fields of government and economics, it often is difficult for them to apply their earlier training. Bridging this gap is an important function of the curriculum.

Throughout the history of the program at Harvard, the Harvard Forest, which is located in Petersham, Massachusetts, about 65 miles from Cambridge, has played an important part. Particularly during the past six years the staff of the Forest has played an increasingly significant role in the program, and the Harvard Forest itself has been used as a demonstration area for problems in renewable resouces. This forest has been under active and continuous experimental management for about 50 years, and has a large amount of readily accessible data on the behavior of the forest resource under management. Its current staff is actively engaged in research in both the biology and economics of the production of wood on the land. Through the program's close relationship with the work of the Harvard Forest, it has acquired materials and ideas that have been extremely useful to the students in seminar work, and the Forest has served as a part of the needed bridge between the earlier training of the students and the heavy emphasis upon the social sciences that is now a part of the program.

Currently, the Graduate School of Public Administration awards from eight to ten fellowships a year to members of the Seminar on Land Use and Conservation. The students are asked to arrive at the Harvard Forest about two weeks prior to autumn registration in the University. These two weeks are devoted entirely to field studies which are designed to give the students a view of the natural resource base in New England and to establish by example the analytical methods used in the Seminar. A few days are spent at the Forest, which provides specific cases in resource management. Then there is a series of trips by automobile to points of interest in the New England states, to illustrate how the concepts used in the Seminar can be applied in the landscape.

The students register in the Graduate School of Public Administration late in September as candidates for the degree of Master of Public Administration. During the two following semesters they are required to take the equivalent of four full courses, one of which is the Seminar on Land Use and Conservation.

The Selection of Students

Students accepted for participation in the program are chosen from among those who have demonstrated their capacity to develop in the resource management field. They are selected also for their promise as contributors to the research work in progress. Those responsible for the program prefer to find these students through the agencies that employ them. The various government agencies concerned with resource management are asked to select promising men from among their personnel and have them present applications for admission to the program. From these applications, already processed by the agencies, the University makes its selection.

By this method of choice, the Fellows who are selected come with the knowledge that their nomination has been supported by their employing agency. From the point of

view of the program, screening by the employing agencies usually means a more effective scrutiny of the candidates than would be possible from direct application to the Graduate School of Public Administration. Not the least of the advantages of this close contact with the state and federal land-use agencies is that it provides a line of communication between the agencies and the program which is useful in keeping the latter up to date on the critical issues in resource-use policy and the direction of new development.

Plans for the Development of the Program

It is expected that in the next few years the general content of the program will be continued. Plans for changes in the timing and location of the work in certain parts of it are now being considered. In addition, it is expected that students from resource management institutions other than the public services will also be eligible for fellowships.

At present the period of student residence is approximately nine months. Under the new plan this would be extended to eleven months, and the students would be asked to come early in July to the Harvard Forest. During the summer the content of the present Seminar on Land Use and Conservation would be given, together with one other course. At the Forest there would be greater facility for field work in the problems with which the Seminar deals. In late September the students would register in Cambridge for four half-courses in the Graduate School of Public Administration, to be completed in the Fall Term. Beginning in February they would be expected to undertake individual research, and to present theses by the end of the Spring Term toward the end of May. Work on this research could be done at the Forest or in Cambridge, or both. In addition, they would be required to take two seminar courses in Cambridge, both of which would come on the same day of the week so that if the students were at the Forest they could easily take them by commuting. Students who wished to pursue graduate work in business administration rather than in public administration would be able to go in September from the Forest to the Graduate School of Business Administration, or those who wished to take a master's degree in Forest Science could stay on at the Forest.

The proposed new program would make it possible to combine the training and research aspects of the program more effectively. It is designed to enhance what has always been the objective of the Land Use and Conservation Seminar—to develop the skills and add to the fund of knowledge that will contribute to a more productive use of renewable natural resources.

Figure 1. The Seminar group has its first meetings in field trips prior to autumn registration. The Harvard Forest in northcentral Massachusetts furnishes an excellent starting place.

Figure 2. On the rock-bound coast of Maine at Mt. Desert Island many land and related marine resource uses, including recreation, are examined.

Figure 3. At a dairy farm in the Champlain Valley of northern Vermont, the seminar group begins some analyses of agricultural economics and land use.

The SCSA in Tomorrow's Living

RUSSELL G. HILL

Russell G. Hill is President of the SCSA, Executive Secretary of the Michigan Soil Conservation Committee and Extension Soil Conservationist at Michigan State University. "The SCSA in Tomorrow's Living" is a condensation of Hill's "Presidential Message" presented at Asheville during the 13th annual convention, October 20, 1958.

LAST YEAR during our California annual meeting, a member in all sincerity asked, "Just what does the *Soil Conservation Society* do?" Frankly, his question caught me slightly flatfooted but after some reflection, I outlined ten broad areas of activity in which our *Society* engages. These ten areas were published in the January 1958 JOURNAL. However, they are of such importance in evaluating *Society* efforts that I shall take time to review them.

1. The *Society* provides professional information to help increase our knowledge of conservation activities and their inter-relationships.
2. It provides opportunities to recharge one's enthusiasm for the conservation profession and the ideals for which it stands.
3. It provides statesmanship to help determine conservation policies.
4. It provides a vehicle by which conservationists from various natural resource interests may become acquainted and exchange conservation information and experiences.
5. It provides educational materials and personnel to help develop informed conservation citizens.
6. It aids in developing standards for professional training in soil and water conservation.
7. It recognizes those who make significant contributions to good land use and to the *Society*.
8. It provides individuals an opportunity to increase their professional standing through participation in an organized program on both a chapter and *Society* level.
9. It offers an opportunity for individuals and groups to contribute time, funds, property, or materials to further the science and art of good land use.
10. It provides an opportunity to help promote better world-wide understanding among professional conservation workers.

What is the *Society* doing in these areas of responsibility?

▶ One responsibility of the *Society* is to help enhance the ability of our professional members. Professional members should have technical competence in their respective resource field. Such members must also have a working understanding of the management of other natural renewable resources, since all of these resources exist in close inter-relationship with each other. As a supplement to technical competence, and as human society becomes more complex, the professional workers, to be successful, must have a keen understanding of people, their social order, and their reactions. For, in most of our work, the science is ahead of the art. Our greatest management problem too often is people, rather than the tree or the acre. Lasting and significant action programs on privately-owned land must await understanding by the operator and his desire for change.

It is inevitable that the role of the land-use scientist in managing natural resources will become immensely more important. Land management for satisfactory and sustaining returns is becoming a complex business requiring the guidance and assistance of well-trained personnel. Concurrently, the responsibility of the professional worker toward becoming more competent also increases. A basic key to technician-operator relationship is confidence. This confidence in the technician must have technical soundness as a foundation.

▶ The *Society* through its chapters must foster the teamwork approach toward resource management. Conservationists working on the ground with a specific project are best able to evaluate the technical, economic and social inter-relationship of a resource project. Multiple resource use cannot be satisfactorily accomplished by a statute or by a regulation. It can best succeed when mutual understanding, respect, and confidence exist at the local level between resource management workers. Such relationships can be fostered by a local chapter through its promotion of discussions, field trips and investigations.

▶ In professional training, the *Society* is interested in two phases: Formal education in our universities and

colleges and, secondly, on-the-job training which occurs largely through self initiative.

Our Professional Training committee, in cooperation with the Conservation Foundation, is working diligently on recommended areas of training for land-use technicians. Many educational institutions are requesting advice on a teaching curriculum to meet tomorrow's training needs in the land-use science. Techniques for developing the land-use specialist with a breadth of perception is generally still unresolved. Concurrently with this study by our professional committee greater effort should be expended toward finding a satisfactory administrative organization in our colleges and universities for teaching, research, and extension in natural resource conservation. This is a major limitation to advancing conservation in many of our institutions of higher learning.

▸ Our JOURNAL, while it must provide challenging information for all *Society* members, regularly carries accounts of research and experiences aimed at furthering the competence of the professional member. Chapter seminars, field meetings, tours, and similar local events—indeed, the *Society's* annual meeting—represent efforts by the *Society* to further improve the ability of its membership.

▸ Another area that I wish to briefly discuss deals with the *Society's* policy on public conservation issues.

The heterogeneous character of our membership makes it difficult to develop *Society* policy except on issues of broad character. Every organization that has objectives, that maintains vitality, that offers leadership must have certain principles for which it stands. An organization cannot expect support from allied interests if it makes no decisions about its own beliefs. Our new Public Policy committee, composed of some of our most able conservation statesmen, is currently making recommendations to the Council on methods to obtain *Society* membership viewpoint on major public conservation issues. I believe this is a forward step by your *Society* and should be encouraged.

▸ Likewise, our working relationship with such groups as the American Association for the Advancement of Science, the Scientific Manpower Commission, the Watershed Congress, the Natural Resources Council, and the Grassland Council, the International Union for Conservation, and the Conservation Education Association represents important phases of our continued effort to make our interests and viewpoints heard in formulating resource programs.

▸ A third area deals with the education and information phases of land use. During the last several years, the financial stability of this *Society* has been greatly dependent on its publication and sale of small booklets. You are to be complimented for your excellent job of salesmanship. Beyond the financial motive is your *Society's* determination to provide useful and practical information on good land and water use to the citizen public. There is no substitute for an informed public. Education is a never ending job. Education based on research is the conservation rock on which action programs depend. Too often in our haste for accomplishment we have neglected to first make sure that this foundation was firm and well established. Communications between the scientist and the citizen constitutes one of our major problems. Our Information Advisory committee working with the JOURNAL Editor, the JOURNAL Editorial Board and our Publications committee are devising JOURNAL stories, information techniques, and more educational booklets to help tell the conservation story. This work must continue to be a major effort by the *Society*.

▸ Space does not permit me to comment more fully on the work of our Water Management committee, even though efficient water use is one of our most critical resource problems. As a resource, water is a requirement so basic that all other resources are dependent on its supply. Otherwise, in its absence, they are valueless for man's use and development. This committee has a tremendous task with such broad problems as water rights, watershed management, water conservation education and others.

The Land Classification and Land Utilization committees are indeed faced with difficult yet important tasks. This subject was dealt with at length at our annual meeting last year and in subsequent *Society* publications. Only a reference to this work will be made here.

The long-time importance of our major food producing areas is not recognized by American people. Not only are these areas becoming pinched into an ever narrowing belt, but, in general, the fertility of our soils under cultivation is still declining. Current surpluses of a few crops are blinding American people to the long-time food producing needs of the world. These are sobering facts. Members of this *Society* have an obligation to make this land-use situation known. Highways and subsequent developments are freezing the land-use pattern of America. We should not stand by and let our best agricultural lands go to other uses by default. Space is rapidly becoming a non-renewable resource. We are looking to the Land Classification and Land Utilization committees to help guide *Society* thinking on these issues.

▸ The membership of this *Society* has just voted affirmatively on a revision of its Constitution and By-Laws. Among the many improvements is a provision to establish a Development Fund. This fund, financed by contributions, bequests, and other special monies, will be administered by a special board under general Council

supervision. Here is a vehicle for individuals, foundations, industries, and citizen groups to become a partner with the *Society* to carry on many special projects. Basic research, technical publications, scholarships, specialized reprints, cum laude awards and unusual education materials are examples of possible Development Fund projects. We urge your support of this new undertaking.

* * *

All our hopes and plans will have little significance unless there is world peace. Ownership and use of land resources have a basic relationship to much international friction. For centuries the misuse of these resources has been a contributing factor to world-wide human misery. The engulfing tide of the desire for self-government throughout the world will be accompanied by an effort to improve the dignity and welfare of the human being. Efficient use of land and water and the related resources must be a fundamental ingredient to meeting the basic needs of people. Only when the stomach is full and the back is clothed can individuals and groups turn to other useful pursuits.

Professional workers and others interested in the science and art of good land use have a moral and practical obligation to further the proper use of natural resources throughout the world. Money alone cannot accomplish conservation. We must expand our efforts of educational and technical assistance to other countries to help them in a manner befitting human dignity and peace.

It is apparent that the success of this assistance rests to a considerable degree on research developed in the geographic area being assisted. This research must not be limited to land practices but must provide some of the answers on how to motivate people to apply scientific methods.

Over 500 of our members live outside North America. For the most part, they are professional members. They offer a nucleus of influential people with whom we can work. The *Society* must strengthen its communications and its services to these members. Our International Relations committee is making excellent progress in this direction. Its work with the International Union of Conservation is outstanding. For the first time in history, the major emphasis at an IUC meeting, held this year in Greece, was placed on soil and water resources. Our *Society* committee is working to have the soil and water section made permanent in the IUC.

Our publications are being printed in other languages. This activity, too, represents additional effort by the *Society* to assist peoples of other lands. Members of the *Society*, traveling throughout the world, have an obligation to contact fellow professional members whenever possible in other countries. Not only is it an obligation that one *Society* member should extend to another, but it is an obligation which all Americans must assume in promoting the better use of natural resources throughout the world.

The situations that I have discussed require concerted and immediate attention. They challenge the ingenuity and the resourcefulness of every one of us.

* * *

The *Soil Conservation Society of America* in a little over a decade has grown from four founding members to an international body of nearly 10,000. It is no longer an experiment. It is mature and proven. Its accomplishments are many. Its future is promising. How the *Society* meets the challenge of tomorrow depends to a great extent on you—the *Society* member.

Your active participation in Chapter and over-all *Society* affairs, your encouragement of their administration, your tolerance of their mistakes, your cognizance of future obligations are vital to the *Society*. The *Society* will, through you, expand its leadership in promoting the science and the art of good land use.

PHOTOGRAPH CREDITS

P. 250—Department of Conservation and Extension, Southern Rhodesia.

P. 251 (Fig. 1)—Department of Conservation, Sydney, Australia; (Fig. 2)—Soil Conservation and Rivers Control Council of New Zealand; (Figs. 3 and 4)—Soil Conservation District, Union of South Africa.

P. 253 (Fig. 5)—South Africa (Country not designated).

P. 254 (Fig. 6)—Soil Conservation Service of Brazil, São, Paulo, Brazil; (Fig. 7)—National Soil Conservation Division of Mexico.

Pp. 255 through 257 (Figs. 1 through 5)—Soil and Water Conservation Research Division, Agricultural Research Service, USDA.

Pp. 260 through 268 (Figs. 1 through 18)—Soil Conservation Service, USDA.

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P. 290—Cartoon by Felix Summers; (*upper right photo*), Don Foster, Nashville (Tennessee) Banner; (*lower right*), Leon Sisk, Spartanburg, South Carolina.

"Photo Contour Mapping"

A NEW TECHNIQUE for aerial surveys known as "Photo Contour Mapping" results in a considerable saving of both time and money.

The Photo Contour Map is produced by photogrammetric and photographic techniques. The resulting map shows both contour lines and a photographic image of all planimetric and cultural details of the area. It is a true map in every respect: an orthographic projection showing both contours and complete air photo detail. It is not a mosaic with contour lines superimposed. On the contrary, in compiling the Photo Contour Map, precise corrections are made for tilt, topographic relief and scale for each photograph. A map accuracy is achieved which is impossible in the preparation of the exact photo mosaic.

The Photo Contour Map is especially useful in the field. By its use, for instance, a scheme for hydroelectric, irrigation or small watershed development can be planned in the office, then field or design personnel can visit the area and exactly locate the critical points or plot in needed information. They can quickly position themselves with this new map, referring to readily recognizable planimetric features and spot elevations and drainage patterns from the contour lines of the map. In addition, geologic data, land use, surface and subsurface drainage systems and other features can be correlated with the basic map with greater facility and accuracy.

Compilation of the Photo Contour Map follows standard photogrammetric mapping procedures and conforms to National Mapping Standards. Additional field control is not required. A map manuscript is prepared in the usual manner, and contours are drawn. A stereo-plotting instrument with which the tilts of each photo can be recorded is used. Planimetric features are not shown on the manuscript, since they will appear as photo-images on the final map sheets.

After the contoured manuscript sheet has been inked or scribed, the photographic processes begin. In the Photo Contour Map process, the air photos are projected onto the manuscript systematically eliminating the distortions caused by tilt, topographic relief and scale changes. This is done through a specially designed projector with which the air photos can be oriented according to the tilt data from the stereo-plotter. This removes the tilt effects. The projector can be raised or lowered to produce photographic images at a common scale, regardless of differences in elevation, throughout the areas to be mapped. Inaccurate work is quickly revealed by mismatches in contours and planimetric features. The map is, therefore, virtually self-checking.

The Photo Contour Map should find wide acceptance for use in basic surveys for all types of engineering and water and land-use projects.

Further information presumably can be obtained by writing to R. M. Towill, Inc., Photogrammetric Engineers, 612 Howard Street, San Francisco, California. [This field note was abstracted in part and adapted from *Western Water News*, Dec., 1957, and printed with figure reproduction, courtesy of this publication.]

A reduction of a "Photo Contour" Map as used by the City of San Francisco in developing a power project. The map shows the large amount of map detail available for the user. A conventional line-drawn map simply would not include all the details seen in the Photo Contour Map. Costs would be prohibitive.

What's Causing the Mortality in Southern Hardwoods?

W. M. BROADFOOT AND E. R. TOOLE

WIDESPREAD DIEBACK AND MORTALITY of hardwoods has been noted in the South during recent years. In general, losses have been most severe in certain areas of cottonwood, sweetgum, and black willow. Some damage also has been noted in red oaks, especially Nuttall; and in elms, green ash, sycamore, and some less important species. On uplands, mortality has occurred in sassafras, hickory, sweetgum, oaks, and yellow-poplar. Drought is now understood to be the basic cause. This article discusses some of the conditions associated with drought, and some of the ways in which it kills trees. Some suggestions are made for land and water management to reduce damage.

Some dieback was noted in sweetgum ten years ago, but its severity and cause were not seriously considered until 1952. About a year later abnormal mortality was observed in some stands of black willow. Cottonwood joined the ranks of species suspiciously affected in 1954, after earlier sporadic mortality on sandy soils. Other hardwood species on a variety of sites were also dying off rapidly, but it was the severe and sudden losses in sweetgum and cottonwood that focused immediate attention on the problem.

Sweetgum Studies Give Clue

Work was started in the South in 1952 toward determining the extent of sweetgum "blight" and its cause, particularly whether a disease organism was involved. Negative results from this line of attack led in 1956 to a study of soil factors. These investigations revealed that certain chemical and physical properties of the soil were significantly related to blight intensity. Dieback was worse on the heavy clays of slackwater areas than on the coarser textured soils of natural levees. In general, high proportion of clay or a high concentration of soluble salts (conditions common to the slackwater soils) tended to be associated with severe blight, probably because these conditions limit availability of moisture.

Not all blight was associated with unfavorable soil attributes, however, and as study progressed it became more and more evident that the most probable cause of dieback and mortality was simply inadequate soil moisture. In turn, the scarcity of solvent may have rendered nutrients unavailable to tree roots.

In addition to hot weather and lack of rain, some causes of inadequate soil moisture are: a build-up of some soil property, such as soluble salts, that tends to increase the tension under which soil moisture is held; poor physical properties that adversely affect available moisture supply in the root zone; land drainage that lowers water tables; and physiographic conditions in the root-zone (such as topography and stratification) that create obstacles between roots and available moisture. In addition, man-caused conditions unfavorable to groundwater recharge, infiltration, or lateral movement may minimize benefits from rains.

Cottonwood dieback, and accompanying mortality, has been even more sudden and spectacular than sweetgum blight, though it has not been observed over so wide an area. Furthermore, it seems to be much more consistently correlated with soil conditions. Most cottonwood dying has occurred on recent natural-levee soils near the Missis-

Figure 1. Dieback and mortality in red oaks and sweetgum. In the same stand there is an occasional dead ash, honeylocust and American elm.

The authors are members of the Forest Service, USDA, and are stationed at the Delta Research Center, Stoneville, Mississippi. The Delta Research Center is maintained by the Southern Forest Experiment Station in cooperation with the Mississippi Agricultural Experiment Station and the Southern Hardwood Forest Research Group.

sippi River. These soils vary from thin to thick stratified beds of silty clay loams, silt loams, and sandy loams over clays. There are also some deep, excessively drained sands. Stands on sandy sites show the most rapid and severe mortality in dry weather. On the average, sandy soils can hold a maximum of only six inches of available water in five feet of soil. Without recharge from rain or rising ground water, this amount of soil moisture is used up by well-stocked fast-growing timber stands in about 15 days. In the last few years many forest sites have suffered more than 15 days of drought, particularly in the early part of the growing season.

Siltier soils naturally can store more available water. A five-foot layer of silt loam can hold, when saturated, about 18 inches of available water. This amount, without recharge, would be a 60-day supply for growing timber. Dieback has been negligible on deep silt loam because drought of more than two months are infrequent.

Poor soil conditions, heat, or lack of rain are not always responsible, of course. A known cause of some mortality in 1955, particularly in hickory and oaks, was a hard frost that came after the trees had partially leafed out.

Man-caused shortages of water are localized, but quite important. Eroded ridges permit little recharge from winter rains. As a result some soils never reach field moisture capacity even during the rainy season. Deep canals have caused excessive drainage near their margins, and thus have reduced tree growth and have increased mortality in these areas. Along the banks of the Mississippi River asphalt revetments sometimes cover underlying outcrop sand lenses, and prevent or deter lateral movement and recharge of ground water when the river rises to root-zone level.

Suggestions for Minimizing Damage

Some principles and practices that might alleviate the loss of hardwoods follow: (1) Keep close check on the condition and vigor of the timber. When early signs of damage appear, thin the stand and salvage merchantable logs and pulpwood. (2) Build low dikes in the forest to impound winter rains. The impoundments help recharge depleted soils and thus increase moisture supply during the growing season. Especially where they contain acorn-producing trees, these impoundments also make for good public relations, for they tend to improve hunting by attracting ducks. Excess water should be released in the spring. (3) Deep drainage ditches and canals should be regulated by a system of gates to prevent too-rapid runoff. Some of the water delayed in the ditches will find its way into soil storage. (4) In uplands, runoff can be slowed by maintaining good ground cover.

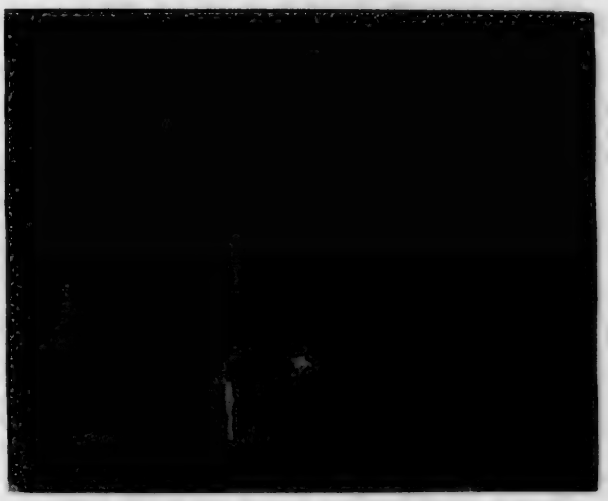

Figure 3. Good 20-year-old cottonwood on silt loam soil. Available moisture has been ample to maintain this well-stocked stand during dry weather.

Figure 2. This deep sandy soil was covered with a good stand of 15-year-old cottonwood a few years ago. Stands on such areas were the first to die.

Revegetation of Road Cuts in Georgia

PAUL TABOR AND C. L. VEATCH

Many road cuts in Georgia are without adequate vegetative protection. The soil material eroded from their bare slopes is responsible in part for the muddy water and excessive sediment downstream. Various efforts have been made to provide adequate vegetative cover of the road cuts. None has been fully accepted by local and state highway officials.

Portions of the cuts of many old highways in Georgia have been completely stabilized by natural revegetation. The writers have studied some of these in search of inexpensive but effective methods of revegetating the numerous bare road cut slopes remaining. Four types of natural revegetation of road cuts have been observed. They may be designated as (1) *basal accumulation*, (2) *overspread*, (3) *self-mulching*, and (4) *spontaneous*.

Basal accumulation is the most common. The eroded soil material from the entire face of the cut accumulates at the base (Figure 1). For this to happen a much reduced grade or slope is necessary at the base, also some protection against loss after accumulation. Where the road cut slopes directly into the road ditch without change in gradient, no basal accumulation occurs. On level or near level land the road ditch is filled with sediment. In a hilly area the erosional debris moves "downstream". Where the road cut has a greatly reduced slope at the base and where an adequate and stable road ditch is removed one and one-half to two feet from the base and runoff from above the cut is diverted, basal accumulation will occur. This accumulation is usually a more favorable medium for plant growth than the road cut surface above. Native, poorland plants soon become established from wind-borne seeds, or heavier seeds that fall down the slope or are carried in by running water.

The pioneer plants observed most frequently on the new zone of basal accumulation are poverty grass (*Aristida dichotoma*), camphorweed (*Heterotheca subaxillaris*), sneezeweed or eastern bitterweed (*Helenium tenuifolium*), bearded weed (*Haplopappus divaricatus*), and rough buttonweed (*Diodia teres*). These short-lived species are succeeded by various perennial poorland species as: broom-sedges or bluestems (*Andropogon spp.*), poorland panicum (*Panicum depauperatum*), wild asters (*Aster spp.*), goldenrods (*Solidago spp.*), golden asters (*Chrysopsis spp.*), native lespedezas (*Lespedeza spp.*), and poorland drop-seed (*sporobolus clandestinus*). Seedlings of native pines (*Pinus spp.*) become established but are usually destroyed by repeated clipping. As the vegetative cover on the zone of basal accumulation develops, more eroded soil material is caught and held above. In this way the zone of basal accumulation widens and under favorable conditions covers the entire slope of the road cut. The process is slow on soils with infertile droughty clay materials in the B and C horizons (Figure 2).

Figure 1. Road cut with basal accumulation of eroded soil and organic materials on a shelf above road ditch. Upper part of bank cut is still in an unstable condition.

Other Natural Revegetation Processes

Numerous instances were observed where short slopes of road cuts were revegetated by stems of Bermuda grass (*Cynodon dactylon*) or Japanese honeysuckle (*Lonicera japonica*), growing down the slopes from rich land above. Other instances were observed of these plants growing up the road cut slopes from rich soils below. Both are included in the overspread type. More fertile soil is needed for this type than for the basal accumulation.

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Figure 2. Road cut sloping into road ditch without lower grade at base is not favorable for basal accumulation of eroded soil materials.

Pine trees grow alongside many road cuts in Georgia. Their branches extend over the slopes. The constant dropping of dead leaves keeps a mulch on the slopes beneath. This self-mulching apparently has not been planned at any place. It is effective in stabilizing short slopes of road cuts.

In some locations where moisture conditions are favorable over the entire surface of road cuts and where erosion is limited, natural revegetation occurs quickly and spontaneously. The entire surface is covered with plants at the same time. This has been observed more often where the B and C horizons are of sand or loam instead of clay.

Techniques of Artificial Stabilization

The observed techniques of artificial stabilization of road cuts with plants have been analogous to the spontaneous and overspread types of natural revegetation. An effective but very expensive one of the spontaneous type is covering the road cut slope with six inches of topsoil and establishing Bermuda grass by sprigging. Another is heavy mulching with native vegetation or crop residues, with or without sowing seed beneath. A third method is to sow seed on a prepared seedbed without mulching.

A type of overspread stabilization is the planting of kudzu (*Pueraria Thunbergiana*) above or below the road cut slope. If fertilized and protected the kudzu vines will cover the slopes. They also spread beyond the slopes. This characteristic has caused most highway planning and maintenance engineers and workers to dislike kudzu. The present trend is to use it only where other plants can not give efficient plant cover. In some places Japanese honeysuckle is used instead of kudzu.

No examples of planned revegetation by basal accumulation or self-mulching from conifer trees have been observed. Both have possibilities, especially on secondary highways. Many road cuts would be revegetated naturally if they were given a slope suited for basal accumulation and the accumulated soil materials protected against flooding (Figure 3). The process of revegetating the zone of basal accumulation could be speeded up by the use of commercial fertilizers and the artificial establishment of suitable plant species by sowing the seeds or planting sprigs. It is realized that this method has limitations. It will not succeed on the most erodible road cuts and will take too long to establish on the very long and very steep and sterile slopes.

Figure 3. Road cut with a favorable slope. Natural stabilization is well started on basal accumulation of eroded materials. Much inexpensive roadside maintenance can be based on an understanding of conditions leading to stable accumulation of basal soil materials and natural revegetation.

FIELD NOTE BRIEFS

WATERSHEDS AUTHORIZED

As of October 1, 1958, a total of 130 projects incorporating 7,358,800 acres of land in 42 states had been approved for operation in the watershed protection program established under provisions of Public Law 566. The projects, the first of which was authorized in 1956, are approved for installation of improvement works.

In all, the Soil Conservation Service office in Washington, D. C., has received 954 applications covering 72,180,900 acres of land located in 47 states and the Territory of Hawaii. Of this total, 375 projects covering 27,805,200 acres have been approved for planning assistance. Maine and Rhode Island are the only states not participating in the program. Texas leads all states in the number of approved projects, 12, with the high acreage, 1,333,800. Oklahoma is next in acreage, 788,400, in seven projects, while North Dakota has 658,700 acres in three projects.

BENEFICIAL WATER RIGHTS

Bruce Bowler, Boise attorney and conservation leader active in the Idaho Wildlife Federation, recently told the Western Association of State Game and Fish Commissioners at its 1958 meeting that fishing is a beneficial use of water which has a definite legal standing under the "first-in-time, first-in-right" doctrine applicable in most western states.

"It is my opinion that where the fishery was first, it has a water right both as to quantity and quality of the water involved sufficient to properly sustain the fishery, which is subject to legal protection in favor of the public interest," he said. "We should begin thinking in terms of bona fide water rights for the fisheries and other wildlife interests involved."

Bowler's statement struck a receptive chord with his audience since some state agency administrators are having difficulty in maintaining fisheries and wildlife projects due to the diversion of water for such purposes as irrigation, power generation and industrial uses.

"The quantity of water we could expect to be included within such water right would be that reasonably sufficient to sustain the fishery," he explained. "We are entitled to a flow sufficient to retain the fishery that held the prior beneficial use."

He said the qualitative standards of the water would pose a similar legal problem. "So long as the pollution of the water was not sufficient to reasonably damage the fishery or wildlife resource having the prior beneficial use right we would not have a case on such facts to restrain, or recover damages for its infringement."

Bowler declared: "It is too long that we have labored under the concept that when reclamation or hydro-electric power or industrial use of a waterway was involved, the fish and wildlife should yield to what was considered a superior use." He added, however, that it is possible to have clean waters, hydro-electric dams, reclamation projects, flood control and fish and wildlife through cooperation and a willingness to recognize other multiple-use benefits of water.

SOIL AND WATER CONSERVATION DEFINED

In approaching the tremendous nationwide task of the inventory of soil and water conservation needs, the USDA has defined soil and water conservation as follows: "Soil, water, forest, and range conservation is the protection, use, maintenance, and improvement of these resources to best serve both private and public interest in providing adequate food, fiber, forest products, recreation and wildlife resources now and in the future.

"Conservation of soil, water, and plant resources is accomplished through making adjustments in land use; protecting land against deterioration; rebuilding eroded and depleted soils; stabilizating runoff and sediment-producing areas; improving cover on crop, forest and pasture lands; retaining water for farm and ranch use and to reduce water and sediment damage; and water management, distribution, and disposal obtained by draining or irrigating land on existing farms or ranches." [The use of natural areas and wilderness areas as control and study areas needs to be spelled out in this definition. Anti-pollution efforts also need to be considered in water management.]

SOIL BANK BENEFITS

South Dakota farmers and ranchers interested in improving game conditions and conserving their land in some of the state's marginal game areas have been offered extra incentive payments for participating in Soil Bank wildlife practices in 1958.

Game, Fish and Parks Commission members have given approval to spending up to $20,000 of game department money to provide more wildlife cover in these marginal areas, through added incentive payments to farmers putting land into the Soil Bank's conservation reserve. The state payments will be in addition to the 80 per cent cost-share reimbursement and annual rental from the federal government.

Ten southeast counties were selected to be eligible for extra incentive payments for the establishment of herbaceous plantings, since that area of the state has a limited amount of nesting cover for wildlife.

Farmers and ranchers in 14 north central counties will be eligible for incentive payments for establishing winter wildlife cover in the form of woody plantings.

Farmers throughout the state will also be eligible for extra payments for establishing water and marsh management practices to benefit fish and wildlife.

ERRATUM

In the July JOURNAL, page 173, reference was made to the "late Prof. W. C. Visser". This should have been "Prof. M. F. Visser." Dr. W. C. Visser is a nephew of the late Prof. M. F. Visser and advises that in Holland there is a saying that "he who is erroneously said to have died, will live to a great age."

COMING EVENTS

American Association for the Advancement of Science will meet in Washington, D. C., Dec. 26-31. According to an announcement received from R. D. Hockensmith, chairman, AAAS Section O—Agriculture on "Water and Agriculture", an excellent paper and discussion program has been arranged.

The schedule is: Dec. 29, a.m., *Water for the Future;* p.m., *Water Sources;* evening, *business meeting* of section; Dec. 30, a.m., *Water Planning and Use;* p.m., *Water Control.* In all, 16 papers are scheduled. The *SCSA* is one of the co-sponsors of the Section, with D. A. Williams, the *Society* representative.

The 13th annual meeting of the **Northeastern Weed Control Conference** will be held Jan. 7-9, 1959, at the Hotel New Yorker in New York City.

McCulloch Corporation has announced customer training sessions on the proper care and maintenance of chain saws and saw chains. Dealers and factory-trained instructors will initiate this service nationwide this fall. Owners of all makes of saws are invited.

January 27-30, 1959—Joint meeting, **American Grassland Council** and **American Society of Range Management,** Tulsa, Okla.

The 14th annual School of Public Administration held at the Montana State University, Missoula, Mont., is scheduled for Feb. 2-27, 1959. For further information write: Public Service Division, Homer E. Anderson, Director, Montana State University, Missoula, Mont.

The National Wildlife Federation will hold its 1959 convention in New York City, Feb. 27-March 1. **The North American Wildlife Conference** follows, March 2-4 at the Statler Hotel in New York City.

The Sixth Biennial Wilderness Conference will be held at the Fairmont Hotel, March 20-21, 1959, in San Francisco, Calif. Theme will be "The Meaning of Wilderness to Science."

An earth-moving Operators School and Construction Equipment Mechanics School is now open. For further information write to **Greer Technical Institute,** 323 East Baltimore St., Wilmington, Illinois.

August 26-29, 1959—14th annual convention of the *Soil Conservation Society of America,* Rapid City, South Dakota.

INEXPENSIVE PLANTER IN MISSOURI

Interest in the conservation of the state's wildlife as well as its soil has resulted in a newly-designed mechanical tree and shrub planter.

The new machine was built by Charles Belshe, Harrison county extension agent, during his spare time this past winter. (Address: Bethany, Missouri.) Hitherto, shrub and tree planters were relatively unknown in this part of Missouri.

Belshe's interest in restoring cover for wildlife, as well as good soil-use practices led to the design of the machine.

The experimental model was constructed by a machine shop following Belshe's design. The initial model cost about $200, but the machine operator thinks future models could be produced for $100. Most seedling planters on the market now cost about $300.

Belshe's machine handles both tree and shrub seedlings. During a two-day span of good weather, the machine planted 20,000 seedlings—most of them multiflora rose. The rose seedlings were planted six inches apart at a rate of 2,000 per hour.

NEW FOREST FIRE RESEARCH LABORATORY TO BE BUILT

A research laboratory will be built at Missoula, Montana, by the Forest Service to work on new and improved methods of controlling forest fires.

The Northern Forest Fire Laboratory will be under the supervision of Jack S. Barrows, chief of the Division of Forest Fire Research for the Intermountain Forest and Range Experiment Station of the Forest Service at Missoula. His staff will include foresters, meteorologists, chemists, and physicists.

The building will be on Federal land at the site of the Forest Service aerial fire depot at the Missoula airport, 7 miles west of the city. This location will permit extensive use of aircraft and smokejumper facilities which include fire equipment, parachute loft, dormitory and mess hall.

The building will contain two wind tunnels, electric ovens, and chambers with controlled temperature and humidity. These facilities will permit testing, under various atmospheric conditions, of the flammability of different types of fuel found in forests and on ranges. New suppression methods can also be tried out under varying conditions.

The laboratory meteorologists will use weather data supplied by the U. S. Weather Bureau's forecasting center nearby. With this advance information they can study lightning, winds and other weather phenomena in the starting and spread of fire.

The location will facilitate cooperative forest research programs with Montana State University and its forestry school. The laboratory plans to work closely with other western universities and all private, State, and Federal forest protection agencies.

It is expected the Munitalp Foundation, Inc., of New York City will continue its cooperation in forest fire meteorological research. The foundation has been working with the Forest Service for the past five years, particularly in the study of lightning-caused fires.

A not too common sight in Missouri. Useful for speeding up plantings for wildlife, windbreaks and woodlands.

REGIONAL FOREST BIOLOGY LABORATORY

Research on midwestern forest biology problems will be conducted at a new laboratory to be established by the U. S. Department of Agriculture north of Columbus, Ohio. Provided for recently by Congress, the laboratory is the first of four such research facilities planned for various parts of the country. Research will be conducted jointly by the U. S. Forest Service and the Agricultural Research Service. The unit will be administered as a part of the Central States Forest Experiment Station, U. S. Forest Service, which has its headquarters in Columbus. A 15,000-square-foot building will be constructed, containing offices and laboratories for about 15 scientists. The building will probably be located near Delaware Reservoir. Provision is being made in the plans for expansion in the future if the need arises.

The laboratory will serve the north-central region of the country and will be devoted chiefly to basic research in the fields of forest insects and diseases. This work will be headed up by Russell R. Whitten, Chief of the Station's Division of Forest Insect Research and by Dr. Carl E. Seliskar, Chief of the Division of Forest Disease Research. Studies have revealed that the forests of this region are falling short of their potential productivity because of defect and decay caused by insects and diseases. One of the primary purposes of the new laboratory will be to help overcome this region-wide problem. In addition, insect and disease pests of ornamental trees will be studied in a special section under the direction of Roger U. Swingle, Pathologist, of the Agricultural Research Service. Construction of the laboratory is to begin next spring and the building is scheduled for completion in 1960.

RANGELAND "ECOLOGY"

Coyotes are getting a break in Colorado, according to word reaching us from the Colorado Game and Fish Department.

Cattlemen controlling more than 200,000 acres of land have posted signs reading, "Coyotes Protected—no hunting, shooting, trapping or poisoning coyotes on this land."

It seems that a campaign to poison the predator was too successful. Now, the ranchers claim, hawks, owls, eagles, weasels and coyotes have virtually disappeared from the range and there's the rub. Rodents, particularly the pocket gopher, multiplied unchecked, being freed from the predatory pressures of the coyotes and birds. The cattlemen estimate the rodents now have eaten more than 30 per cent of the range with forage losses of more than $3 million.

So now the coyote is being protected by those who formerly despised him. And, here is another example of a most interesting inter-relationship that exists in land-use patterns and changes on western rangelands.

POPULATION IS A FACTOR

"The only way for us to have enough land for everybody is to kill off lots of people in a big war." This was the conclusion at which my boyhood companion and I arrived as we searched in the wire grass and black jet oaks for pine knots to keep the fire going in the one-room schoolhouse we attended deep in the Sand Hills of South Carolina.

It was 50 years ago, but I remember our consideration of "increasing population" and "diminishing natural resources," although I am quite sure neither of us ever had heard those terms.

Little did we realize that in just a few years we and our schoolmates would be engaged in the greatest war ever known. And that within our lifetime an even more tragic and destructive conflict would involve virtually the entire world.

But the wars, tragic and destructive as they were, did not solve the problem as we in our youthful ignorance anticipated. They only made it worse. The answer to the dual problem was not, and is not, to be found in the decimation of nations through warfare.

Now, with the better understanding of such problems which comes with maturity, and a knowledge of the proper conservation and use of our natural resources, it is evident that our needs can be met only by the use of appropriate conservation measures, properly applied. Only in this way can the fields, pastures and forests of our country and other lands provide for and sustain an ever-increasing world population. And it is to the everlasting credit of conservationists everywhere that they are undertaking to conserve the priceless heritage of natural resources before it is too late. We who are members of the *SCSA* must continue to share and extend our contributions to this end.

T. S. BUIE
Columbia, South Carolina

Book Reviews

HOMBRE Y SUELO (MAN AND SOIL). *(Special issue dedicated to Dr. Hugh H. Bennett.) Associacion Amigos del Suelo (Association of Friends of the Land), Avenida Alvear 1654, Buenos Aires, Argentina. 136 pp., illus. October-December, 1957. (No price given.) (Reviewed by* WALLACE E. AKIN, *Des Moines, Iowa.)*

The Argentine Association of Friends of the Land have paid an impressive honor to Hugh H. Bennett by dedicating this issue of their quarterly publication to his visit to that country. This tribute to Dr. Bennett consists of a detailed account of the conferences held during his visit and a summary of the Argentina provinces which were included in his tour. Readers with a knowledge of Spanish will find this an interesting and informative publication and will enjoy reading of Dr. Bennett's visit and his comments and reactions to the conservation problems of the agricultural and pastoral lands of Argentina.

RESOURCE TRAINING FOR BUSINESS, INDUSTRY, GOVERNMENT. *Published for the Natural Resources Study Committee by The Conservation Foundation, 30 East 40th Street, New York 16, N. Y. 160 pp., indexed. 1958. (No price given.) (Reviewed by* D. E. WADE, *Des Moines, Iowa.)*

This is a report, including nine background papers, agenda of the conference, and a condensed report of the "Conference on Graduate Training in Resources" held at the University of Michigan, April 27 and 28, 1956. The meeting was co-sponsored by The Conservation Foundation and the School of Natural Resources of the University of Michigan. Participants (29) attended on invitation and represented higher education, government, business and industry. (Among those present were several members of the *Soil Conservation Society of America:* Ayers Brinser, Stanley A. Cain, Charles Dambach, Edward F. Dolder, Edward H. Graham, Roger D. Hale, Paul A. Herbert, Justin W. Leonard, Charles W. Mattison, H. H. Michaud, Paul B. Sears, Gilbert F. White and Harold G. Wilm.)

This slim volume is packed with much excellent material, although there are no startling new ideas presented. It does give some directions that resources training might take in order to meet some of the needs of business, industry, government, and the professions (e.g., law) in obtaining persons trained in conservation.

Obviously, even with a slate of distinguished and competent participants, a two-day conference is not sufficient to get hold of the topics and to reach common grounds of understanding, definitions and intent. One almost gets the impression, on reading the volume, of a "hit and run" performance. Apparently to offset this weakness, a number of the invited conferees have banded together in a self-perpetuating "Natural Resources Study Committee" to be made up of five to 25 members. As of December 1956 there were nine members on the committee. (Six are *SCSA* members: Stanley A. Cain, Edward H. Graham, Walter C. Gumbel, Roger D. Hale, Lloyd E. Partain and Paul B. Sears.)

The committee's first work of importance apparently has been to prompt the publication of *Resource Training*. It is to be hoped that this committee, which has assumed an important function, will give effective and widespread publicity to its continued efforts. By so doing the committee will not become a "closed" corporation, but will give educators and others something to "shoot at". This committee might also consider holding some of its meetings throughout the United States on an open basis. Such a procedure would tend to keep channels of communication open, and might, over the years, be stimulating to thousands of individuals in education, business, industry, agriculture, and government who are now conducting "resource training" on a "grass-root" level. This would help many individuals and institutes obtain a much better "sense of the historical, economic, and social significance" of conservation.

It would seem that there could be a great strengthening of conservation education if this committee would tie its efforts to those of the Conservation Education Association. Surely such a union would mutually strengthen each group.

Resource Training is worthwhile for its printed lines and what is or was between the lines. Nevertheless, the Committee is doomed to failure and the weaknesses of ingrowth if it does not continue to give widespread publicity to its discussions and concepts. The time lag of April, 1956 (conference) to July of 1958, when *Resource Training* (report of conference) was distributed, bears upon these remarks. Nevertheless widespread distribution of this publication, as well as widespread reprinting of much of its contents, is greatly to be desired.

A review of this book by panels within *SCSA* chapters would be a most worthwhile project, particularly if there are in attendance local representatives of business, industry, agriculture, the professions, as well as conservation technicians and educators.

AMERICAN AGRICULTURE: GEOGRAPHY, RESOURCES, CONSERVATION. *By* EDWARD HIGBEE. *John Wiley & Sons, Inc., 440 Fourth Ave., New York 16. 399 pp., illus., index. 1958. $7.95. (Reviewed by* WALLACE E. AKIN, *Des Moines, Iowa.)*

This one-volume treatment of the agriculture of the United States does an excellent job in a limited space of summarizing the basic resources of agriculture: soil, plants, and water, and the role they play in the various agricultural regions of the country. Especially interesting is the presentation of typical farms from each region with a detailed land-use map of each. Each of the farms subjected to detailed analysis in the book have been visited and studied by the author and were selected to illustrate wise land use and conservation under a variety of environmental conditions.

The book makes good use of numerous maps and figures and includes an appendix of maps of major crops based on the 1954 census. This book should prove valuable in acquainting the general reader with the diverse agricultural regions of the United States and their land-use problems.

LANDSCAPES OF ALASKA: THEIR GEOLOGIC EVOLUTION. *Edited by* HOWEL WILLIAMS. *Prepared by members of the United States Geological Survey, National Park Service and Department of Interior. University of California Press, Berkeley 4, California. 148 pp., illus., index, glossary of geologic terms. 1958. $5. (Reviewed by* WALLACE E. AKIN, *Des Moines, Iowa.)*

Directed at the serious layman, this book analyzes the scenic resources of Alaska on the basis of their geologic origins. The editor of the book expresses the hope that some understanding of the complex geologic history of the landscapes of an area will enhance the appreciation of their scenic beauty. The authors of the various chapters are specialists on the sections of Alaska about which they write, and succeed in presenting the technical aspects of scenery in a way which should be understandable to the non-geologist, although the average reader will have to rely heavily on the rather complete glossary of geologic terms which is included as an appendix.

THE CHALLENGE OF OUR WATERSHEDS. *Proceedings of the Development Centre on Watershed Management for Asia and the Far East. 167 pp., list of participants, glossary, not indexed. Soil Conservation Society of India, Hazaribagh, Bihar, India. 1957. ($3.50 per copy.) (Reviewed by* D. E. WADE, *Des Moines, Iowa.)*

The meeting from which this publication of 27 papers was derived was described in the November, 1957, JOURNAL, page 290. The papers of the meeting have now been published by the Soil Conservation Society of India, with a large number of books purchased by the Food and Agriculture Organization of the United Nations, Rome, Italy, for distribution in Europe, the Near East, Africa and the Americas. (Address: F.A.O., United Nations, Viale delle Terme di Caracalla, Rome, Italy.)

Soil and water conservationists, as well as libraries and educators, will want to have this publication. It is a reference and summary and brings together many viewpoints and much basic material, until now not available under one cover.

In view of the unity that characterizes land and water management via the watershed approach, this publication ought to have great influence throughout a large part of the world. The *Soil Conservation Society of America* should be most happy that several of its members made substantial contributions to the Proceedings.

LITERATURE BRIEFS

Soil Erodibility and Other Physical Properties of Some Iowa Soils. By John E. Adams, Don Kirkham, and Wayne H. Scholtes. From Iowa State College Journal of Science, Vol. 32, No. 4, May 15, 1958, pp. 485-540. 15 tables, appendix. Iowa State College Press, Bldg., Ames. $2.

Mulch Farming to Conserve Soil and Water. By J. T. McAlister. 1958. 12 pp., illus. USDA, Soil Conservation Service, Orangeburg, S. C. No price listed.

1958 Agronomy Abstracts. American Society of Agronomy. Abstracts of papers given at Lafayette, Indiana, August, 1958. 76 pp., indexed. American Society of Agronomy, 2702 Monroe St., Madison 5, Wisconsin. (No price given.)

Illinois Water Rights Law. By John E. Cribbet. 1958. 73 pp., mimeographed, appendix. Water Resources Committee, Illinois State Chamber of Commerce, 20 N. Wacker Drive, Chicago 6. $1.

Sediment Is Your Problem / Wasted Soil and Water. By Gunnar M. Brune. 1958. 16 pp., illus. For sale by Supt. of Documents, U. S. Govt. Printing Office, Washington 25, D. C. 10c.

Facts About Mississippi's Water Resources. By the Mississippi Board of Water Commissioners. 59 pp., illus. 1958. Board of Water Commissioners, 429 Mississippi Street, Jackson. Free.

Save Indiana's Waters. (No date.) 16 pp., illus. Free distribution by Division of Water Resources, Indiana Dept. of Conservation, Indianapolis.

Metropolitan Water Problems. By Bernard Frank. 1958. 21 pp., illus. Prepared for the Joint Committee on Washington Metropolitan Problems, 85th Congress, 2nd Session. U. S. Govt. Printing Office, Washington, D. C. (No price listed.)

Our Natural Resources — and Their Conservation. By Richard L. Neuberger. 1956. 28 pp., illus. Public Affairs Pamphlets, 22 E. 38th St., New York 16, New York. 25c.

The Cooperative Extension Service . . . Today. Issued by the Federal Extension Service, Washington 25, D. C. 1958. 14 pp., illus. USDA. (No price given.) An excellent report, well prepared and easily read.

Problems of United States Economic Development. 374 p. 1958. Committee for Economic Development, 711 5th Avenue, New York 22, N. Y. $2.50.

The 48 papers included here are part one of a CED project supported by funds from the Ford Foundation. Each writer was selected and asked to write 2,000 words on the question: "What is the most important economic problem to be faced by the United States in the next twenty years?"

The papers are grouped under such headings as: International Relations (8 papers); Relations between Wealthy and Poor Countries (8 papers); Economic Stability (8): Uses of Economic Growth (6); Philosophy of Free Institutions (6); Problems Resulting from Economic Growth (4); Congestion of Urban Problems (4); Problems Resulting from Changes in the Size and Composition of Growth Population (2); and National Security (2).

A second volume of papers on the same question will be published when contestants in a second phase of this CED project have been judged. The competition was open to anybody in the Free World.

Soils: An Introduction to Soils and Plant Growth. By Roy L. Donahue. 349 p., index, chapter references, 19 tables, illus., appendices: Glossary, Conversion Factors, Atomic Weight and Valence of Common Elements. 1958. Prentice-Hall, Inc., 70 Fifth Ave., New York 11, N. Y. $9.

This is an excellent introductory book, easy to read and look at. It does not contain a description of agencies and organizations concerned with soil and water management. Apparently planned for college level, but could be adapted for use on a high school level. However, it may be too high priced.

Soil Chemical Analysis. By M. L. Jackson. 497 p., index, 23 tables, questions for each chapter, end tables, illus. 1958. Prentice-Hall, Englewood Cliffs, N. J. $12.

M. L. Jackson is professor of soils at the University of Wisconsin. He has prepared an integrated text of procedures and fundamental principles that should foster progress in the science of soil chemistry. This is a college text, with discussions of principles and a suggested outline for a 16-week course in laboratory procedures.

Topsoil and Civilization. By Tom Dale and Vernon G. Carter. University of Oklahoma Press, Norman, Okla. 270 p., illus., six maps, index, bibliography. 1955. $3.95.

As is stated in the preface, "this is not a technical study of history based on first-hand knowledge or original research. It is a summary of conclusions and interpretations of history arrived at after long study and wide reading, mainly of secondary source materials."

The authors have brought together materials and thought that cannot be found in part except by reference to many scattered publications.

This book, instigated by the National Wildlife Federation, should be included in all high school, public, college and university libraries. It can serve well as background reading in social science, history, biology, engineering, agriculture, and conservation courses.

Land: The Yearbook of Agriculture 1958. USDA, Washington 25, D. C. 605 p., illus., index. 1958. For sale by Supt. of Documents, Washington 25, D. C. $2.25.

Heritage, management of public lands, use of private lands, financial aspects, rights, taking care of what we have, forest lands, territorial aspects, future needs and planning for the future—these are the topics that make up a truly fascinating, forward-looking and stimulating yearbook.

A unique section involves 32 aerial views of typical farm regions throughout the United States. Such photos should be made available separately to educators in a portfolio, preferably larger-size prints.

The Law of Water Allocation in the Eastern United States. Edited by David Haber and Stephen W. Bergen. 643 p., bibliography. 1958. Ronald Press Company, 15 East 26th St., New York 10, N. Y. $7.50.

This is a valuable contribution and includes the papers and proceedings of a symposium held in Washington, D. C. in October 1956, sponsored by The Conservation Foundation. A "detailed" table of contents provides the reader with a finder of sorts, although an index is needed. In reviews of this book that have appeared in other technical journals, it is pointed out that the topics involving recreational and wildlife uses of water have not been adequately treated.

Water Resources. Edited by M. G. Shimm; eight authors. *Law and Contemporary Problems*, Vol. 22, No. 3, Summer, 1957, pp. 324-537. For single copies ($2) write to Law and Contemporary Problems, Duke Station, Durham, North Carolina.

This volume should have widespread circulation. It is of the same high quality of presentation as No. 2, Vol. 22, which dealt with "River Basin Development" (see review, p. 235 in the July 1958 JOURNAL).

The Millstone Watershed. Prepared by Rutgers Planning Service. 83 p., 10 maps, illus. 27 charts and tables. 1957. Stony Brook-Millstone Watersheds Association, Box 171, Pennington, N. J. $2.

This is a "regional planning pilot study" of the Millstone (includes Stony Brook) watershed in central New Jersey. Dr. Edward B. Wilkens serves as director of the Planning Service which is a part of the College of Engineering of Rutgers, the State University. An excellent presentation is made of many aspects of watershed planning, including recreational uses of land and water. Aside from following most of the usual concepts involving watershed planning, the study urges protection of the open lands and areas of unique character most susceptible to unpredictable violent change or misuse.

This publication is worthy of careful study by any group involved in watershed planning or development.

Range, Its Nature and Use. American Society of Range Management, Committee for Cooperator with Youth Organizations (Karl G. Parker, chrmn., Montana State College, Bozeman, Mont.). 62 p., illus., appendix. Jan. 1958.

This basic manual is offered by the ASRM as a pattern upon which state and local agencies may publish their own locally adapted range manuals, primarily for youth groups.

A limited number of copies of *Range, Its Nature and Use* will be furnished to any interested agency or organization in preparing for free distribution such locally adapted manuals which will contain in principle materials from this basic manual. Distribution has already been made to at least 30 states. An excellent publication.

Conservation of Natural Resources. Edited by Guy-Harold Smith. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. 474 p., illus., bibliographies (chapters and general), index. 1958 (2nd edition). $8.50.

Nineteen contributors prepared the 23 chapters. The book has 8 major parts: (1) history, public domain and economics; (2) soils, soil conservation, irrigation; reclamation, grasslands; (3) forestry; (4) water supplies, water power, waterways, floods and control; (5) minerals and mineral fuels; (6) wildlife and fisheries; (7) recreation and conservation of man; and (8) state, local and national planning.

The book deals primarily with resources in the USA. Problems of balancing resources and anticipated population demands for resources needs more rigorous treatment. This is one of the better introductory texts on the subject.

Saline Water Conversion: Proceedings of a Symposium 4-6 November 1957. Edited by Martin A. Mason. 459 p., illus., bibliography, list of authors and participants, symbols. Not indexed. 1958. $5.

This publication, No. 568, may be purchased from the Printing and Publishing Office, National Academy of Sciences—National Research Council, 2101 Constitution Ave., Washington 25, D. C. Make checks or money order payable to the *National Academy of Sciences*.

The 45 papers form an up-to-date treatise on saline water conversion worldwide. Discussions of various methods of conversion are thoroughly represented.

The book, **Resource Training,** reviewed in this issue, was originally distributed free June 1958 to a list of approximately 4,000 including very many in the conservation field, universities, bankers, planners, area development people, business executives and others, including a number in Canada and a few in Europe.

Since this original distribution, the Conservation Foundation, 30 East 40th St., New York 16, N. Y., has received over 400 requests for the book. Whenever the requests come from those who seem to be in a position to profit from the book, it is sent free of charge. A few copies are still available for free distribution to those who can show a bona fide reason.

Methods of Weed Control. By Earl A. Helgeson. 1957. 189 pp., illus., indexed. Food and Agriculture Organization of the United Nations, Rome, Italy. 30c

The Chemical Control of Aquatic Nuisances. By Kenneth M. Mackenthun. 1958. 64 pp., illus. Published by Committee on Water Pollution, Madison 1, Wisconsin. (No price listed.)

16 Plants Poisonous to Livestock in the Western States. 1958. Prepared by U. S. Dept. of Agriculture. 49 pp., illus. in color. For sale by Supt. of Documents, U. S. Govt. Printing Office, Washington 25, D. C. 35c.

Pesticides: Their Use and Toxicity in Relation to Wildlife. By Robert L. Rudd and Richard E. Genelly. 1956. 209 pp., 33 tables, appendix. State of California Dept. of Fish and Game, 722 Capitol Ave., Sacramento 14. No price given.

Pesticides and Wildlife. By Lucille F. Stickel and Paul F. Springer. 1957. 122 pp., mimeographed. U. S. Dept. of Interior, Fish and Wildlife Service, Washington 25, D. C. Wildlife Leaflet 392. Free.

The Pesticide Problem. By Dr. John L. George. 1957. 67 pp., mimeographed. The Conservation Foundation, 30 E. 40th St., New York 16. No price given.

Ten Years of Strip-Mine Forestation Research in Ohio. By Raymond F. Finn. 1958. 38 pp., illus., 15 tables. Prepared by USDA, Forest Service, 111 Old Federal Bldg., Columbus 15, Ohio. (No price listed.)

A useful summary that will help in other states in solving a difficult problem much more widespread than thought by uninformed.

The National Forest Yearbook for 1957. U. S. Forest Service. 1957. 24 p., illus. USDA, Forest Service, Ogden, Utah. No price listed. (Covers the Intermountain Region.)

Regional reports of the Forest Service show much imagination in format and style. This is helpful in getting information read.

New York Tree Farm and Mill Tours. (No date.) 19 pp., end map of New York State. New York Forest Industries Committee, Box 218, Deferiet, New York. Free.

The New Role of the Soviets In the World Economy. By Michael Sapir. 1958. 64 pp., 4 tables, appendices. Committee for Economic Development, 711 5th Ave., New York 22, New York. 50c.

This "committee" has prepared many helpful publications for understanding better the role played in natural resources by economics.

Conservation and You. 1957. 32 pp., illus. Eight articles issued by Minnesota Education Association, 41 Sherburne Avenue, St. Paul 3, Minnesota. 25c.

Vital Issues. Our Natural Resources—Have We Enough? Will They Last? (Vol. III, No. II) 15 pp., illus., and **Our Great Outdoors—What Are We Doing About It?** (Vol. VII, No. III) 4 pp., illus. Center For Information on America, Washington, Conn. 25c each, subscription 10 copies a year, $2.00.

An interesting series apparently aimed at adult education primarily—but also used in schools.

Conservation Experiences for Children. By Effie G. Bathurst and Wilhelmina Hill. 1957. 192 pp., illus. Bul. 1957, No. 16, U. S. Dept. of Health, Education, and Welfare. For sale by Supt. of Documents, U. S. Govt. Printing Office, Washington 25, D. C. 75c.

This will be a widely used publication of special value to teachers. Many activities and projects are suggested for children. Our only criticism is that the *SCSA* and its popular-type booklets were not mentioned.

The Glory Trail. By Ernest Swift. 1958. 50 pp. National Wildlife Federation, 232 Carroll Street, N.W., Washington 12, D. C. Single copies free.

Our Vanishing Open Spaces. By Peter M. Stern. 1958. 9 pp. The Conservation Foundation, 30 E. 40th St., New York 16. (No price given.)

Urban Sprawl. By William H. Whyte, Jr. 8 pp. illus. Reprinted from Fortune, January 1958, Time Inc., New York.

Mission 66 in Action. (No date.) Published by U. S. Dept. of Interior, National Park Service, Washington 25, D. C. 12 pp., illus. (No price given.)

Drainage of Agricultural Lands. Edited by James N. Luthin. 620 p., index, references, 25 tables, illus. 1957. American Society of Agronomy, 2702 Monroe St., Madison 5, Wisconsin. $11, plus $ .50 for delivery to all foreign countries.

This is Vol. 7 of *Agronomy Monographs* published by the American Society of Agronomy. A technical publication dealing with the physics, theory, engineering, investigation methods, and relations to soils and crops aspects of land drainage. Will be of value to field men and in the laboratory and classroom.

★ ★ ★ ★ ★

Natural Resources of Arizona—A Guide for Improved Teaching, published in 1950 by the Arizona Conservation Club, is still available at $2.25 postpaid in lots of one to ten; ten or more at $2.15. Orders should be addressed to Dr. B. Ira Judd, Agricultural Division, Arizona State College, Tempe, Arizona.

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News Notes

Secretary's Column

The Thirteenth Annual Meeting of the *Society* proved to be the largest yet with 1,136 members and guests, including some wives and families, registering at Asheville. Hotel and eating facilities were filled to capacity with delegates from more than 60 of the *Society's* chapters in attendance.

The hospitality by members of the North Carolina Chapter and their other friends in the Southeastern Region was noted by all, especially by the 1,100 who attended the free barbecue Monday night and those who enjoyed the reception Sunday afternoon. Undoubtedly every conferee at Asheville visited the snack bar and enjoyed the apples, cider, peanuts, and other refreshments as well as souvenirs. Outstanding "early-bird" door prizes of furniture, smoked hams, clothing, tobacco products, and other items were claimed by many.

It would be impossible to list all committees and members who contributed to the meeting, but a special vote of thanks should be extended to and through Staton McIver, chairman of the North Carolina Chapter; Charles Patton and C. L. Hunt, co-chairmen of local arrangements; J. R. Sasser, chairman of the program committee; and A. H. Veasey, council member for the Southeast.

The meeting sessions were held in the Asheville City Auditorium and the George Vanderbilt Hotel next door. In the basement of the auditorium the largest exhibit ever staged at a *Society* meeting was much in evidence. Commercial displays by companies working with soil conservationists throughout America were present. Educational booths by various agencies working in conservation combined with fifteen chapter exhibits and a *Society* publications rack, made a tour of exhibit hall something to be remembered. "Ducks on the pond" (actually ducklings in a large wading pool) surrounded by pine boughs provided a lively centerpiece for the exhibit.

Other statistics on the meeting available as the JOURNAL went to press include the following: 810 *Society* members paid their registration fee, the rest were guest and family members At the banquet there were 760 people. Some 242 ladies toured the Biltmore Estate while 517 men made a tour the following day. The business luncheon was attended by 209 ticketholders on the final day of the meeting. At least 50 more stood in the rear of the room to hear the procedures.

Press representatives of 12 publications were much in evidence and coverage of the meeting extended into Canada as 32 Canadians were present. Local press coverage was excellent. At least 12 tapes were cut for use by various chapters and individuals. The Farm and Home Hour staff worked out a fine program which was put on the air nationally, Oct. 25, by the National Broadcasting Company.

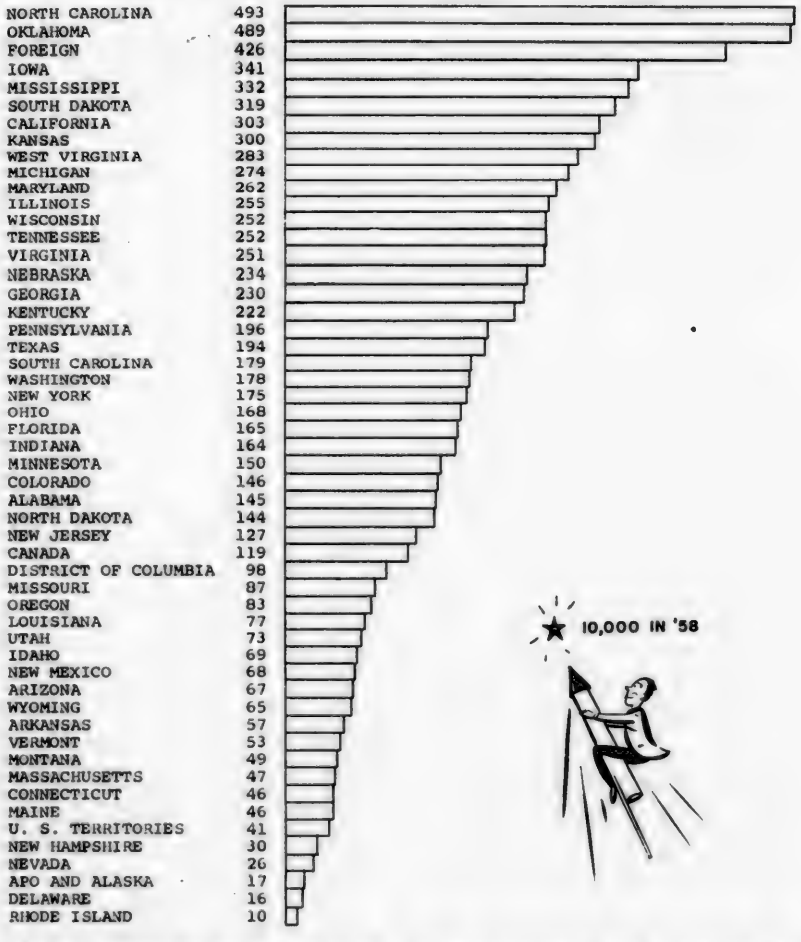
In addition to the paper sessions where the members gained inspiration and information from the speakers, and the hospitality provided by the hosts, Nature extended her own warm welcome with beautiful fall coloration.

Many families combined some vacation with the trip to the meeting.

The South Dakota delegation was much in evidence and reminded us that the next convention is only ten months away. The South Dakotans suggested that members and families start making plans now for the August 26-29, 1959 convention to be held in Rapid City, South Dakota.

Not to be forgotten, the Canadians, too, were reminding Asheville convention "goers" to plan to attend the 1960 meeting at Ontario Agricultural College, Guelph, Ontario, August 28-31, 1960.

SCSA Membership, October 1, 1958



***Society* membership has reached an all-time high. The chart gives the membership as of October 1, 1958. On October 15 it had reached 9,105 and as the JOURNAL went to press the membership was approaching the 9,500 figure. Harold M. "Dutch" Rhodes, chairman of the membership committee, said at Asheville, "A little extra-special effort on behalf of members during these last two months of 1958 will place the membership at 10,000 by the end of the year." Late gains, for instance, have placed the North Carolina membership well in excess of 500.**

NEW 1959 OFFICERS

Alvin C. Watson of Bryn Mawr, Pennsylvania, was elected president of the *Soil Conservation Society of America* during the recent balloting by mail. Announcement of elections was made at the *Society's* meeting in Asheville, North Carolina.

Watson is a native of Pennsylvania and majored in engineering and soil technology at Pennsylvania State University where he also received an M.S. degree in agronomy. He has served in various capacities with the Soil Conservation Service and for a time was assistant regional director for the Northeastern States. More recently he has been director of Administrative Services, Washington, D. C., but during the past year he was appointed River Basin representative for the U. S. Department of Agriculture in the Northeast. He has offices at 7600 West Chester Pike, Upper Darby, Pennsylvania.

Watson is a charter member of the *Society* and served as secretary for three years prior to the opening of the *Society's* office in Des Moines, Iowa, 1952. He has served as first vice-president and chairman of the program development committee during 1958. In 1952 he was elected a Fellow.

Elmer L. Sauer of Champaign, Illinois, was elected first vice-president in the recent election. He is now completing a term as second vice-president and previously served a three-year term on the council. Sauer earned his B.S., M.S., and Ph.D. degrees from the University of Illinois. A charter member and Fellow of the *Society*, he has contributed numerous articles to the JOURNAL OF SOIL AND WATER CONSERVATION and has served as chairman of the JOURNAL editorial board during 1957 and 1958. Sauer is employed by the USDA Agricultural Research Service serving the Cornbelt states.

Walter C. Gumbel, formerly editor of the JOURNAL OF SOIL AND WATER CONSERVATION, was elected second vice-president. Gumbel is a graduate of Pennsylvania State University. He has held positions in the Extension Service and Soil Conservation Service before he became conservationist for the Monongahela Power Company, Fairmont, West Virginia, the position he now holds. He is active in many other organizations related to resource development and is a charter member and Fellow of the *Society*.

Howard F. Barrows, formerly with Austin-Western Works at Aurora, Illinois, but more recently retired and living in St. Augustine, Florida, was elected treasurer for the fourth term. He has been active in developing improved accounting systems for the *Society* as it has grown in the last few years.

Re-elected council member for the Western Region for a three-year term was Herbert A. Hopper of Lafayette, California. Hopper is a charter member and has long been active in *Society* affairs and has served as chairman of the awards committee since 1954. He has resided in California for more than 15 years. He is a native of New York and a graduate of Cornell University. Before joining the Division of Soil Conservation, California Department of Natural Resources, he was a soil scientist for the Soil Conservation Service.

New council member-at-large is Harold M. Rhodes of Morgantown, West Virginia. Rhodes is a graduate of West Virginia Wesleyan College and joined the Soil Erosion Service (Soil Conservation Service) in 1934, and has continued to hold positions with that agency. He is now SCS state conservation engineer in West Virginia, in charge of the engineering on the small watershed program. Rhodes is a charter member of the *Society* and was made a Fellow in 1956. For the past several years he has served as chairman of the *Society's* membership committee.

Other council positions were not up for election this year. The 1958 council and officers are listed on the masthead page of the JOURNAL. The term of office for the newly-elected men starts on January 1, 1959.

LETTER

To the Secretary:

The enclosed dues notice finally caught up with me. It must have been sent by Explorer I and we don't have a landing field here for such craft.

Was sure I had sent my dues but can't find any record of it so I am sending a check for both 1958 and 1959 to be sure I don't slip up this year.

I was transferred from the Philippines to Cambodia the first of the year and our mail has been very uncertain. The JOURNAL is normally six weeks to two months late to the Philippines and it takes almost another month from the P. I. to Cambodia. Many times our forwarded mail goes back to San Francisco because of the F.P.O. address so I haven't been surprised at not receiving the JOURNAL. The I.C.A. sends us a copy via the diplomatic pouch so I have had access to copies.

My return date is about Oct. 1 so I hope to be able to attend the annual meeting.

Cambodia is quite different from the Philippines and not nearly as far advanced. They have serious soil conservation problems but haven't realized them as such.

We hope to have some Cambodians in the U. S. A. this year for training and then they will be eligible for *SCSA* membership. There are only a few who read English but many are studying.

Sincerely,
Ralph O. (Pete) Lewis

CONVENTION PHOTOS AND SLIDES

A number of members of *SCSA* attending the Asheville convention obtained photographs and color slides of meetings, hospitality, exhibits and field trips.

Here at the *SCSA* office in Des Moines, we wish to obtain lists of such photos and slides. It may then be possible to move forward from such lists to work out arrangements for copies, particularly of slides, and to build up a slide set to send out on loan to chapters for showing at meetings prior to the 1959 convention.

TOP AWARD TO NORTH CAROLINA

In addition to being such a wonderful "host" for the 13th annual *SCSA* convention, the North Carolina Chapter was top winner in the second annual 1958 Chapter Activity Contest.

The North Carolina chapter was cited "for the outstanding way in which it worked side by side with the soil conservation district supervisors of the state in promoting conservation education in the schools, in getting the cooperation of local business men, in selling *Society* publications and raising funds for *Society*, chapter, and district programs, and in showing generally how *Society* members and district supervisors can work together in common cause."

L-R—Staton McIver, *chapter chairman*, H. N. Kelly, Charles Patton, and R. G. Hill admire the award plaque presented to the North Carolina Chapter for placing first nationally in the 1958 Chapter Activity Contest.

Fellows and Honorary Members 1958

Thomas L. Ayers

George M. Browning

Stanley A. Cain

THE SOIL CONSERVATION SOCIETY OF AMERICA *annually selects individuals who have made outstanding contributions to the science of soil and water conservation to honor as Fellows and Honorary Members.*

FELLOWS—*This honor goes to members professionally engaged in practicing, investigating, or teaching soil and water conservation.*

THOMAS L. AYERS, *Washington, D. C.* Now serving as Assistant to the Administrator, Agricultural Conservation Program Service, Ayers has been in conservation work for over 25 years.

He received his B.A. degree in Agriculture from Clemson College, South Carolina in 1918 and his M.A. degree from Peabody College, Tennessee in 1929.

After serving two years in the Army, he taught Vocational Agriculture in Dillon, South Carolina for five years and for ten years at Clemson College. In 1934, while still teaching, Ayers became field agent of the Cotton Division of the Agricultural Adjustment Administration. His next position was as Chief of Program Development Section of the Southern Division of the AAA and later became Assistant Director of the Southern Division of the AAA. Prior to his present position, he was Chief of the Program Planning Division of the ACP Branch of the PMA.

Ayers has been a professional member of the Washington, D. C. Chapter No. 1, in which he has held several offices and chairmanships, since its origin and a *Society* member for 11 years.

GEORGE M. BROWNING, *Ames, Iowa.* A native of Missouri, Browning received his B.S. from the University of Missouri and his M.S. and Ph.D. from the University of Virginia.

From the time of his graduation from the University of Missouri in 1932, Browning has been actively engaged in soil conservation work, and at the present is Associate Director of the Iowa Agricultural Station, Ames, Iowa.

The development of soil erosion factors which are used in many states as a guide for estimating runoff and erosion and for planning control measures is attributed to Dr. Browning's leadership and extensive knowledge in this field.

A Charter member and one-time member of the National Council, he has been described as one of the builders of the *Society*. He is a past chairman of the Iowa Chapter and has served on both Chapter and *Society* committees.

STANLEY A. CAIN, *Ann Arbor, Michigan.* As Charles Lathrop Pack Professor of Conservation in the School of Natural Resources of the University of Michigan and chairman of the Department of Conservation since its creation in 1950, Cain has been engaged in conservation work since 1924 when he received his B.S. from Butler University. Later he received his M.S. and Ph.D. from the University of Chicago.

Dr. Cain has pioneered in developing a graduate course of study preparing students of various backgrounds to apply their interests and training in the many phases of natural resource development and conservation. He is also currently responsible for four formal conservation courses at the University of Michigan.

A professional member of the *Society* for many years, Cain has been active on both Chapter and *Society* levels. He has held several offices and chairmanships in the Michigan Chapter and has been a member of *Society* committees and of the Editorial Board of the JOURNAL. Cain has been an active advisor and participant in the Michigan Student Chapter since helping to organize it in 1954.

LLOYD L. HARROLD, *Coshocton, Ohio.* Now Project Supervisor, Soil and Water Conservation Research Station, ARS, USDA, he has been engaged in water studies since 1930 and soil and water conservation research since 1935. Prior to his present position, he was a member of the Washington staff of the Research Division, SCS.

Harrold has professionally furthered the cause of soil and water conservation regionally, nationally, and internationally since he was assigned as supervisor of the Coshocton Station. For these efforts, he was awarded the Hugh H. Bennett Gold Medal for "His outstanding contribution to the cause of soil and water conservation" by Friends of the Land in October 1953.

Results of his work have appeared numerous times in the JOURNAL and other professional publications. He was awarded a certificate of recognition for an outstanding article which appeared in the JOURNAL, October 1956.

Harrold is a Charter member of the All Ohio Chapter *SCSA* and was in January 1958 elected Chairman of this Chapter.

CYRIL LUKER, *Washington, D. C.* A long and faithful record of service as a Charter member of the *Society* and as a leader in the field of soil and water conservation won the rank of Fellow for Mr. Luker.

After graduation from high school, Luker entered Texas A & M College and started his lifetime career as a specialist in agriculture. He is now assistant to the Administrator of the Soil Conservation Service and is responsible for the working details of SCS leadership in the Great Plains Conservation Program. Mr. Luker started his career with the SCS in 1935 and since then has held many important positions with this agency of the Government.

As the first charter member (holds the No. 1 card) of the *Society*, he has encouraged the formation of several chapters in the Southwest.

FRANK H. MENDELL, *Des Moines, Iowa.* State (SCS) Conservationist since 1937, Mendell received his B.S. and M.S. from Iowa State College.

Because of Mendell's leadership, soil conservation has had remarkable success in Iowa. Under his guidance, 100 very active Soil Conservation Districts have been organized and cover the entire state. The Little Sioux Flood Control Project in Iowa has become a guide for establishing similar projects nationwide.

Mendell is a professional member of the Iowa Chapter and a Charter member of the *Society*. He is past chairman of the Iowa Chapter and has served on several committees, both in his Chapter and the *Society*.

Lloyd L. Harrold

Cyril Luker

Frank H. Mendell

William Allan Rockie

D. Harper Simms

WILLIAM ALLAN ROCKIE, *Spokane, Washington.* Rockie, a native of Nebraska, received his B.S. from the University of Nebraska and did graduate study at the University of Nebraska, USDA Graduate School, and Washington State College.

Although he retired from the Soil Conservation Service in 1952, he has continued to be active as a soil conservation consultant, lecturer and investigator. He has a distinguished record in soil and water conservation. He has made soil, climate, and land-use studies in at least 14 states, including Alaska and British Columbia, and the Sahara Desert and Sudan in Africa. He has prepared many technical and popular articles and bulletins on land problems in Alaska, the Pacific Northwest, the Middle West and the South.

As a Sustaining member of the *Society,* he has been active in the Portland and the Inland Empire Chapters of the *Society* and has served on the *SCSA* Glossary committee and is presently a member of the Archives committee.

D. HARPER SIMMS, *Washington, D. C.* An SCS employee since 1936, Mr. Simms is now Director of its Information Division. He advises the Service administrator on policies relating to the agency's information work and is responsible for planning and carrying out the program throughout the United States and its Territories.

Simms attended Park College, Missouri, New Mexico A & M, and the University of Missouri in preparation for his lifetime work in information and soil conservation.

Simms is a Charter member of the *Society* and has been active in both the Rio Grande and Washington, D. C. No. 1 Chapters. He has served as secretary, vice-chairman, and chairman of the Washington, D. C. No. 1 Chapter. He has served on the arrangements committee for several of the *Society's* national meetings and is currently serving a third term as head of the committee on special publications that has issued the *Society's* cartoon-style story books, "Story of Land" and "Wonder of Water".

HONORARY MEMBERS—*This recognition goes to individuals who are not professionally engaged in conservation. They are selected on the basis of their contribution to soil and water conservation and without regard to membership in the Society.*

HERBERT B. EAGON, *Delaware, Ohio.* A native of Ohio, Eagon is now Director of the Ohio Department of Natural Resources in Columbus.

He attended Ohio State University and now is owner and operator of a 346-acre farm, which is under complete conservation management. He served as vice-president of the Ohio Federation of Soil Conservation Districts from 1950-1951 and as area vice-president of the National Association of Soil Conservation Districts for two years. He has been popular as a keynote speaker at state, regional and national meetings.

Eagon received the "Farmer of the Year" award in 1951 and the "Citizen of the Year" award in 1958, both of which were presented by the Delaware Chamber of Commerce.

HERSCHEL D. NEWSOM, *Washington, D. C.* As Master of the National Grange since 1950 and a farmer, Newsom brings to his position a lifetime of experience in agriculture and conservation.

Newsome holds key membership positions of national importance in at least 23 organizations, many of which are concerned with soil and water conservation.

ERVIN L. PETERSON, *Washington, D. C.* As Assistant Secretary of Agriculture, he has made many notable contributions to the conservation of soil, water, timber and wildlife.

Under his leadership, the first soil and water conservation advisory committee to the USDA was appointed. Prior to his appointment in 1954, Peterson was active in dairy and general farming in Oregon, where he served for more than 11 years as director of the state Department of Agriculture.

Peterson supervises the work of three major conservation agencies of the Department—Forest Service, Soil Conservation Service, and Agricultural Conservation Program Service—as well as the Agricultural Research Service, Farmer Cooperative Service, and Federal Extension Service.

His many contributions to soil and water conservation have been significant and far reaching.

Herbert B. Eagon

Herschel D. Newsom

Ervin L. Peterson

CHAPTER NEWS

South Alabama Chapter secretary-treasurer is Mildred S. Lee, Evergreen, Ala. The **North Alabama** chapter secretary and treasurer is R. N. Hoit, P.O. Box 1370, Anniston, Ala.

Arizona Chapter: Ralph E. Harris, 3438 W. Ocotilla Rd., Phoenix, is secretary-treasurer. There are 67 *Society* members in Arizona.

Ozark Mountain Chapter (Arkansas) had Buford Poe of Fort Smith and Craig Rosborough of Bentonville present at the chapter delegate session in Asheville. Poe is chairman of the chapter, C. W. Bedell is vice-chairman and Miss Connie Moore is secretary-treasurer.

Ontario Chapter (Canada) held a meeting in January with L. R. Webber, Soils Dept., Ontario Agricultural College, Guelph, serving as chairman for the year. A number of the Ontario chapter members were keen observers at Asheville. The 1960 convention of the *SCSA* is scheduled for *Guelph, Ontario,* August 28-31.

Washington, D. C. No. 1 Chapter was noticed in the *USDA Employee News Bulletin* of Sept. 17 with a story on the educational work of the committee headed up by Murry Thompson and featured in the July JOURNAL, page 195.

Northern Illinois Chapter is planning its November meeting around the topic of "Communications in Conservation." Emphasis will be on "better" communications and "new developments" affecting conservation. The No. 10 newsletter continues on a high plane that places it among the top chapter newsletters received in the JOURNAL office.

Student Branch of the chapter has been organized at the University of Illinois. George Walker is the contact person.

Northern New England Chapter (Maine, Vermont, and New Hampshire) held an executive committee meeting to plan for the national conference. L. Russell Albright, Orono, Maine, is serving as president of the chapter. Secretary-Treasurer is Lewis E. Parlin, Box 162, Milford, Maine.

South Central Oklahoma Chapter held its spring meeting in the Wichita Mountains Wildlife Refuge near Lawton. Much of the rich plant and animal life, including some of the longhorn cattle with horn spreads of over seven feet, were seen in the wild. The Fish and Wildlife Service is a cooperator with the Comanche county soil conservation district and gives the SCS technicians full credit for restoring and building up the range's native grasses. Julian A. Howard, refuge manager, showed colored slides illustrating "before and after" range improvement.

The Banks of Grady county furnished 2,800 copies of "The Wonder of Water" to all school children grades 4 through 8. Vernon Martin of Chicasha did the selling job which enriched the chapter treasury by $140. Only two old members are now delinquent, there were 68 renewals and 70 new memberships.

Iowa Chapter had 65 members and a number of guests present for a two-day annual fall meeting at Fort Dodge on Oct. 8. A panel on Iowa's new water law, headed by John Timmons, Leslie Faber and O. R. McMurry, followed the banquet. A field trip to a gypsum mine and a panel made up of research, business and farm representatives gave the audience a better perspective of conservation problems.

William Penn Chapter (parts of Pennsylvania, New Jersey, and Delaware) has Norman Tripp, U.S. Forest Service, Center Bldg., Upper Darby, Pa., serving as chairman. According to a letter from Edward A. Miller, the official address for the chapter is 7610 West Chester Pike, Upper Darby, Pa.

REMEMBER TO GET A NEW MEMBER

Keystone Chapter (Pennsylvania), according to a recent communication from David G. Unger, president, has a committee at work to develop a student chapter for Pennsylvania, to headquarter at Pennsylvania State College. Many of the Keystone members have been occupied this year with details involving the National Plowing Contest and Conservation Exposition. New secretary for the chapter is James M. Wise, SCS, Sunbury, Pa. Joseph Sacco of the chapter had an article, "The Wonder of Water", in the Sept. 1958 *Soil Conservation* describing how some third graders in Sunbury used the *Society's* booklet, *The Wonder of Water.*

Some Mississippi Chapter stalwarts. *L-R,* C. W. Steadman, *v.-pres.;* David T. Webb, *pres.;* and Mrs. Ann Murdaugh and R. R. Covell, *sec'y-treas.* and *chairman,* respectively, of the West Central Area of the Chapter.

The dates: August 26-29, 1959, *SCSA* convention, Rapid City, South Dakota. It's not too early to schedule now in your calendar of events this important Society event. A great family-vacation area awaits you in South Dakota.

Some of the Iowa Chapter and guests took an air tour of the Little Sioux watershed, June 7.

The Kentucky Lake Chapter uses most of two quarterly meetings to stress professional improvement. The group that inspected the Dixon Springs Illinois Expt. Station. At extreme right is R. Webb, Station Supt. Third from right is Wayne Williams, chapter chairman.

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CONVENTION PAPERS AVAILABLE

Mimeographed copies of most of the papers presented during the 13th *SCSA* annual meeting in Asheville, N. C., are available from the *Society's* office at 838 Fifth, Ave., Des Moines 14, Iowa.

Non-registrants may secure papers by remitting 25c for single copies or $2 for an entire set. These charges are necessary to cover cost of producing, handling and mailing. The program as printed in the July JOURNAL is about the same as was presented at Asheville. Sigurd Olson ("Resource Conservation for Recreation and Wildlife Needs") took the place of Conrad Wirth. Morris E. Fonda gave the paper on "Industry's Role in Conservation."

Chairman W. J. Huddleston *(right)* of the (Tenn.) Andrew Jackson Chapter receives the chapter charter from H. W. Pritchard, SCSA Executive Secretary, Aug. 14. Huddleston is head of the Dept. of Agronomy in the Tenn. Technical Inst. at Cookesville. It was 106° F. in the shade that day!

PUERTO RICO CHARTER

Puerto Rico Chapter, with 23 charter members on the original petition, received its charter during the 13th annual *SCSA* convention at Asheville. David Gomez, ASC, Box 8037, Santurce, P. R., was elected temporary chairman. Harry M. Chambers, director, Caribbean area, SCS, received the charter from President Russell G. Hill during a fitting ceremony at Asheville. Presently, the new chapter intends to serve the entire Island of Puerto Rico, although within a year or so a separate chapter may be organized at Mayaguez for the western side of the Island.

The charter for the Puerto Rico Chapter is received by Harry Chambers *(left)* from SCSA President R. G. Hill at the national convention, October 22.

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NEWS OF MEMBERS

Charles Hood, formerly area conservationist located in Des Moines, Iowa, is now state soil conservationist, SCS, with headquarters in Columbia, Missouri.

D. O. Kearns, who has been Illinois Assistant State Conservationist, replaces Harry Chambers at Stillwater, as Oklahoma State Conservationist.

John Grant, past chairman of the West Virginia Chapter, was recently admitted as a general partner of the firm of Hutchins and Parkinson, members of the stock exchange in Boston.

Dr. Lyle T. Alexander, in charge of USDA soil survey laboratories, received his LL.D. at the University of Arkansas last May.

William van Dersal, SCS, addressed the "Men of The Land" at a meeting in Sydney, Australia, during a recent visit. His talk was published in *The Living Earth,* Autumn, 1958.

C. W. Renaud, SCS technician, located at Oakland, Iowa, helped cooperate in getting some graphic news items and photographs in a "soil and water conservation week" issue of local newspaper, *The Oakland Acorn.* All through the nation, men like Renaud, who are on the job daily and largely unsung, make substantial contributions not only to the technology of soil and water conservation, but to cooperating in disseminating information and assisting in the education of the public.

In this particular issue of *The Oakland Acorn,* we also spotted at least 16 cartoon-style drawings done by the JOURNAL'S "contributing artist", **Felix Summers.** Space for these was purchased from the newspaper by local advertisers.

J. S. Russell, past president of the *SCSA,* was party leader for a group of agriculturally-minded travelers on a tour of Great Britain and western European countries. He got back in time for the *SCSA* conference.

Among those members of the *SCSA* receiving an award in the USDA Honor Awards Ceremony held May 27, 1958, in Washington, D. C., were: *Distinguished Service Award:* **Donald A. Williams;** *Superior Service Awards:* **Frank E. Bivens,** SCS, Union, W. Va.; **Evan D. Bolton,** SCS, Nacogdoches, Tex.; **Cecil W. Chapman,** SCS, Athens, Ga.; **Henry L. Clark,** SCS, Crowley, La.; **Elwin R. Duncan,** Ext., Ames, Iowa; **Phoebe O'N. Harrison,** SCS, Washington, D. C.; and **Austin L. Patrick,** SCS, Washington, D. C.

Joseph J. Pierre, SCS agronomist located at Urbana, Ill., has designed a conservation slide rule. The device is based on research data on amount of soil and water loss from farm lands.

Noble Clark, associate director of the Agricultural Experiment Station at the University of Wisconsin, and an Honorary member of *SCSA*, spent a month in Poland on invitation of Polish agricultural scientists. Clark had visited Poland in 1947 as head of FAO team. Travel costs were paid by the Rockefeller Foundation. Clark sent two Kodachromes for the editorial staff of the JOURNAL to examine. One showed Mr. Tadeusz Rutkowski of Pulawy, Poland, who ten years ago obtained a copy of a book written by H. H. Bennett. Inspired by what he read, this young Polish soil scientist, installed, under the supervision of Prof. dr. Ziemnicki of the University of Lublin, what Clark believes to be one of the first series of strip croppings and terraces as soil conservation structures in Poland.

Chester S. Wilson of Stillwater, Minn., and a Fellow in the *SCSA* has been appointed by President Eisenhower to serve as one of the seven citizen appointees to the National Outdoor Recreation Resources Commission established by the 85th Congress. The Commission will inventory national recreational resources, project usage into the years 1976 and 2000 and recommend means of meeting anticipated needs, reporting finally by Sept. 1, 1961.

Ed Keil, George Moore and **Homer (Curley) Stennett,** all with the SCS, were appointed to the advisory council of the New York State Outdoor Education Association.

John R. Carreker, Watkinsville, Ga., is the new research liaison representative for SCS and ARS in the nine Southeastern states. Carreker, who succeeds **R. Y. (Dick) Bailey,** will headquarter at Athens, Georgia.

Bob Barre, SCS area conservationist at Hillsboro, Ohio, and a twelve-year member of the *Society*, was on annual leave until October 15 to manage the U. S. plowing team at the 6th World Plowing Matches in Germany. Barre also gave a paper on Conservation Tillage Methods in the North Central States at the first International Soil Cultivation Conference in Stuttgart, West Germany.

Edward H. Templin, soil correlator in the Great Plains States, was elected a Fellow in the American Society of Agronomy at its recent annual meeting at Lafayette, Indiana.

Guy D. Smith, in charge of SCS soil survey investigations and a member of the editorial board of the JOURNAL, is the new president of the Soil Science Society of America.

Gilbert Cox presented plaques for outstanding accomplishments at the annual NASCD banquet to **Dave Maxwell,** Quincy, Fla., **Gus Threlkeld,** Corinth, Ky., **T. Wilbur Thornhill,** Charleston, S. C., **Waters S. Davis, Jr.,** League City, Tex., **Joe B. Douthit, Jr.,** Pendleton, S. C., and **A. D. Holmes, Jr.,** Demopolis, Ala.

Harry R. Woodward, Pierre. S. D., has been named director of the South Dakota Department of Game, Fish and Parks.

NECROLOGY

Everett C. Sackrider died on arrival at the hospital after suffering a fatal heart attack at his home in East Lansing, Michigan, August 24, 1958. Mr. Sackrider became the state's first state soil conservationist in 1937 and continued to fill that position until his death. He is survived by his widow, Ruth, and three sons, Charles, John and David.

Orrie Shiffer, veteran SCD leader in Wisconsin, died at his home near Eau Claire August 29. Shiffer, a former president of the State SCD Association, was a member of the State Soil Conservation Committee. Surviving him are his wife, Hazel, a son and two daughters.

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If we continue to limit soil nutrition to N-P-K . . .

Are today's crop yields the best we can expect?

THERE'S no question about the value of the primary plant foods — nitrogen, phosphorous and potash. Farmers everywhere recognize their worth and need. They are beginning to line up also on the side of the trace elements for both plant and livestock nutrition.

But a third group of vital minerals has been somewhat orphaned by the attention given the so-called primary and minor plant foods. Yet these three — calcium, magnesium and sulphur — play an equally important role in the harvesting of big yields.

In spite of this, little recognition is given their essential and vital part in crop growth and fruit formation.

Take magnesium as an example. All plant life needs it. It is a factor in the development of chlorophyll which in turn stimulates every conversion and production function involving life from the soil. Magnesium rivals phosphorus for importance in seed formation. It aids in the fixation of nitrogen by legumes. It builds disease resistance by producing balanced nutrition.

Quick proof of magnesium's need can be gotten from figures showing crop absorption. Four tons of alfalfa take 50 pounds of magnesium oxide equivalent. Ten bushels of ear corn take 1 pound from the soil; two tons of soybean hay, 33 pounds; two tons of peanut vines, 25 pounds; every 300 bushels of sweet potatoes, 17 pounds.

In New York experiments, tomato crops produced $130 more crop value per acre over non-magnesium fortified fields. In Cornell tests, potato yields jumped up 15% when half the potash was derived from Sul-Po-Mag. Sweet corn tests showed a 15.6% rise in yield with magnesium added to the soil in proper balance. Seed cotton yields went up 93 pounds per acre with magnesium supplying the extra grow-power. Still other recommendations show tobacco needs an average of 30 to 40 pounds of magnesium oxide equivalent in the fertilizer per acre.

From Maine to Florida, Wisconsin to the Atlantic Coast . . . and in many Western areas . . . Extension Service Soil Scientists and Chemists have established areas of magnesium deficiency.

The reasons stem from many causes. Heavy rainfall, erosion and over-cropping of the land have cut deep into natural reserves. And high analysis fertilizers have added to the shortage because the carrier that before contained adequate amounts of magnesium for yearly crop growth has been replaced by increased percentages of N-P-K. An 0-20-27, for example, doesn't have much room for a filler.

Magnesium deficiencies may be overcome by adding dolomitic limestone to the soil. But more in keeping with modern fertilization is Double Sulphate of Potash-Magnesia . . . proved profitable and practical in every crop area. Double Sulphate of Potash-Magnesia corrects magnesium deficiencies, and at the same time, builds up dwindling reserves of sulphur . . . a hard-to-recognize plant need because the negative symptoms so closely resemble nitrogen starvation.

To be completely effective for cropping and for mixing, the ideal magnesium form is water-soluble and granular in structure. International Minerals markets water-soluble magnesium under the trade name Sul-Po-Mag.* It offers all of the formula flexibility needed to match the requirements of specific crops, and also, is custom-tailored for direct application where only potash and magnesium fertilization is indicated.

Granular in form, Sul-Po-Mag stays in the soil longer to feed the crops longer — and sustain growth over the season to help produce top yields.

For complete information on the role of Sul-Po-Mag in plant nutrition and its application to specific crops write for our free magnesium booklet. Address International Minerals and Chemical Corp., Potash Division, Administrative Center, Skokie, Illinois.

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INTERNATIONAL MINERALS & CHEMICAL CORPORATION

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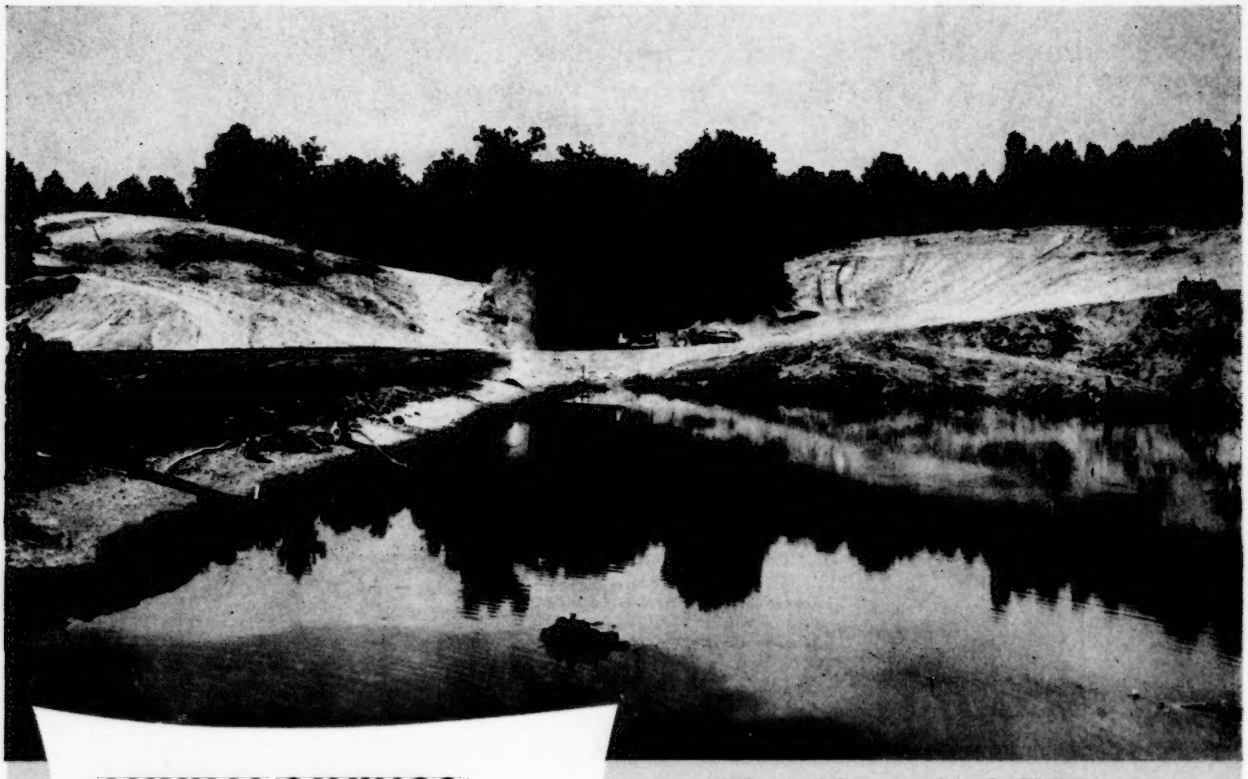

ANNUAL SAVINGS:
615,100 tons of Georgia soil!

Fill material is spread on the 76,157 cu. yd. floodwater retarding structure by a Cat D6 Tractor with No. 60 Scraper.

Goal of the North Fork Broad River Watershed project is to save 615,100 tons of Georgia soil—perhaps save human lives, livestock, buildings and water—and make better agriculture possible. The project includes floodwater retarding structures, farm ponds, erosion control measures and pasture seeding.

Playing an important role in the river-taming act is the Mewborn Construction Co. of Hartwell, Ga. This firm has the contract for building six of the ten floodwater retarding structures scheduled in the project.

One typical structure was No. 4 on Freeman Creek, about five miles southeast of Toccoa, Ga. Specifications called for clearing and grubbing 12.5 acres, excavating 3,508 cu. yd. and building a 76,157 yd. structure embankment. A 240-foot drop-inlet conduit of 24-inch reinforced concrete and an emergency spillway were included.

Charles R. Mewborn, President of Mewborn Construction Co., was awarded the contract on the basis of his knowledge of earthmoving and the performance of his Caterpillar-built equipment.

It is no coincidence that Cat equipment owners, such as Mr. Mewborn, are so frequently awarded contracts. With Cat equipment, they can move more yardage, faster and at less cost.

Let Cat dependability, economy and work capacity work for you, too. Your Caterpillar Dealer is the man to see. The time—NOW!

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